1

Fluid Mechanics

1. A fluid is the one, which
- (*a*) cannot remain at rest under the action of shear force.
- (*b*) continuously expands till it fills any container.
- (*c*) is incompressible.
- (*d*) permanently resists distortion.

2. In an incompressible fluid, the density is
- (*a*) greatly affected by moderate changes in pressure.
- (*b*) greatly affected only by moderate changes in temperature.
- (*c*) not affected with moderate change in temperature & pressure.
- (*d*) sensible to changes in both temperature & pressure.

3. Potential flow is the flow of
- (*a*) compressible fluids with shear.
- (*b*) compressible fluids with no shear.
- (*c*) incompressible fluids with shear.
- (*d*) incompressible fluids with no shear.

4. Potential flow is characterised by the
- (*a*) irrotational and frictionless flow.
- (*b*) irrotational and frictional flow.
- (*c*) one in which dissipation of mechanical energy into heat occurs.
- (*d*) formation of eddies within the stream.

5. Newton's law of viscosity relates the
- (*a*) shear stress and velocity.
- (*b*) velocity gradient and pressure intensity.
- (*c*) shear stress and rate of angular deformation in a fluid.
- (*d*) pressure gradient and rate of angular deformation.

6. Dimension of absolute viscosity is
- (*a*) $ML^{-1}T^{-1}$ (*b*) MLT^{-1}
- (*c*) $ML^{-1}T$ (*d*) MLT

7. Poise is converted into stoke by
- (*a*) multiplying with density (gm/c.c.).
- (*b*) dividing by density (gm/c.c.).
- (*c*) multiplying with specific gravity.
- (*d*) dividing by specific gravity.

8. Dimension of kinematic viscosity is
- (*a*) MLT^{-1} (*b*) $L^2 . T^{-1}$
- (*c*) L^2T (*d*) $L^2 . T^{-2}$

9. With increase in the temperature, viscosity of a liquid
- (*a*) increases
- (*b*) decreases
- (*c*) remains constant
- (*d*) may increase or decrease; depends on the liquid

10. For water, when the pressure increases, the viscosity
- (*a*) also increases (*b*) decreases
- (*c*) remains constant
- (*d*) first decreases, and then increases

11. The pressure intensity is the same in all directions at a point in a fluid
- (*a*) only when the fluid is frictionless.
- (*b*) only when the fluid is at rest having zero velocity.
- (*c*) when there is no motion of one fluid layer relative to an adjacent layer.
- (*d*) regardless of the motion of one fluid layer relative to an adjacent layer.

12. Choose the set of pressure intensities that are equivalent.
- (*a*) 4.33 psi, 10 ft. of water, 8.83 inches of Hg.
- (*b*) 4.33 psi, 10 ft. of water, 20.7 inches of Hg.
- (*c*) 10 psi, 19.7 ft. of water, 23.3 inches of Hg.
- (*d*) 10 psi, 19.7 ft. of water, 5.3 inches of Hg

13. For a fluid rotating at constant angular velocity about vertical axis as a rigid body, the pressure intensity varies as the
(*a*) square of the radial distance.
(*b*) radial distance linearly.
(*c*) inverse of the radial distance.
(*d*) elevation along vertical direction.

14. The centre of pressure is
(*a*) always below the centroid of the area.
(*b*) always above the centroid of the area.
(*c*) a point on the line of action of the resultant force.
(*d*) at the centroid of the submerged area.

15. A rectangular surface $3' \times 4'$, has the lower 3′ edge horizontal and 6′ below a free oil surface (sp. gr. 0.8). The surface inclination is 300 with the horizontal. The force on one side of the surface is
(*a*) 39.6*y* (*b*) 48*y*
(*c*) 49.2*y* (*d*) 58*y*

where, *y* = specific weight of water

16. A stream tube is that, which has.....cross-section entirely bounded by stream lines.
(*a*) a circular (*b*) any convenient
(*c*) a small (*d*) a large

17. Mass velocity is independent of temperature & pressure, when the flow is
(*a*) unsteady through unchanged cross-section.
(*b*) steady through changing cross-section.
(*c*) steady and the cross-section is unchanged.
(*d*) unsteady and the cross-section is changed.

18. In turbulent flow, the
(*a*) fluid particles move in an orderly manner.
(*b*) momentum transfer is on molecular scale only.
(*c*) shear stress is caused more effectively by cohesion than momentum transfer.
(*d*) shear stresses are generally larger than in a similar laminar flow.

19. Turbulent flow generally occurs for cases involving
(*a*) highly viscous fluid
(*b*) very narrow passages
(*c*) very slow motion
(*d*) none of these

20. An ideal fluid is
(*a*) frictionless & incompressible.
(*b*) one, which obeys Newton's law of viscosity.
(*c*) highly viscous. (*d*)none of these.

21. Steady flow occurs, when the
(*a*) conditions change steadily with time.
(*b*) conditions are the same at the adjacent points at any instant.
(*c*) conditions do not change with time at any point.
(*d*) rate of the velocity change is constant.

22. Which of the following must be followed by the flow of a fluid (real or ideal) ?
(*i*) Newton's law of viscosity.
(*ii*) Newton's second law of motion.
(*iii*) The continuity equation.
(*iv*) Velocity of boundary layer must be zero relative to boundary.
(*v*) fluid cannot penetrate a boundary.
(*a*) I, II, III (*b*) II, III, V
(*c*) I, II, V (*d*) II, II, V

23. Discharge from a 24 inch pipe of water at 10 ft/sec will be.....ft^3/sec.
(*a*) 7.65 (*b*) 32.36
(*c*) 48.22 (*d*) 125.6.

24. The unit of velocity head is
(*a*) ft-1b/sec (*b*) ft-1b/ft^3
(*c*) ft-1bf/1b (*d*) ft-1bf/sec.

25. Bernoulli's equation describes the
(*a*) mechanical energy balance in potential flow.
(*b*) kinetic energy balance in laminar flow.
(*c*) mechanical energy balance in turbulent flow.
(*d*) mechanical energy balance in boundary layer.

26. The kinetic energy correction factor for velocity distribution of laminar flow is
(*a*) 0.5 (*b*) 1.66
(*c*) 1 (*d*) 2

27. In frictional fluid flow, the quantity, $\frac{P}{\rho} + \frac{V^2}{2g_c} + \frac{gz}{g_c}$, is
(*a*) constant along a streamline.
(*b*) not constant along a streamline.

(*c*) increased in the direction of flow.
(*d*) none of these.

28. The momentum correction factor for the velocity distribution of laminar flow is
(*a*) 1.3 (*b*) 1.66
(*c*) 2.5 (*d*) none of these

29. The head loss due to sudden expansion is
(*a*) $\frac{V_1^2 - V_2^2}{2 g_c}$ (*b*) $\frac{(V_1 - V_2)^2}{2 g_c}$
(*c*) $\frac{V_1 - V_2}{2 g_c}$ (*d*) $\frac{V_1^2 - V_2^2}{g_c}$

30. The head loss due to sudden contraction is proportional to
(*a*) velocity (*b*) velocity head
(*c*) turbulence (*d*) none of these

31. The value of critical Reynolds number for pipe flow is
(*a*) 1300 (*b*) 10,000
(*c*) 100,000 (*d*) none of these.

32. Reynolds number for flow of water at room temperature through 2 cm dia pipe at an average velocity of 5 cm/sec is around
(*a*) 2000 (*b*) 10
(*c*) 100 (*d*) 1000

33. Shear stress in a fluid flowing in a round pipe
(*a*) varies parabolically across the cross-section.
(*b*) remains constant over the cross-section.
(*c*) is zero at the centre and varies linearly with the radius.
(*d*) is zero at the wall and increases linearly to the centre.

34. Discharge in laminar flow through a pipe varies
(*a*) as the square of the radius.
(*b*) inversely as the pressure drop.
(*c*) inversely as the viscosity.
(*d*) as the square of the diameter.

35. Boundary layer separation is caused by the
(*a*) reduction of pressure below vapour pressure.
(*b*) reduction of pressure gradient to zero.
(*c*) adverse pressure gradient.
(*d*) reduction of boundary layer thickness to zero.

36. The friction factor for turbulent flow in a hydraulically smooth pipe
(*a*) depends only on Reynolds number.
(*b*) does not depend on Reynolds number.
(*c*) depends on the roughness.
(*d*) none of these.

37. For a given Reynolds number, in a hydraulically smooth pipe, further smoothening .....the friction factor.
(*a*) brings about no further reduction of
(*b*) increases
(*c*) decreases (*d*) none of these

38. Hydraulic radius is the ratio of
(*a*) wetted perimeter to flow area.
(*b*) flow area to wetted perimeter.
(*c*) flow area to square of wetted perimeter.
(*d*) square root of flow area to wetted perimeter.

39. Hydraulic radius of $6'' \times 12''$ cross–section, is.....inches.
(*a*) 2 (*b*) 0.5
(*c*) 1.5 (*d*) none of these

40. Reynolds number is the ratio of
(*a*) viscous forces to gravity forces.
(*b*) inertial forces to viscous forces.
(*c*) viscous forces to inertial forces.
(*d*) inertial forces to gravity forces.

41. Mach number is the ratio of the speed of the
(*a*) fluid to that of the light.
(*b*) light to that of the fluid.
(*c*) fluid to that of the sound.
(*d*) sound to that of the fluid.

42. Power loss in an orificemeter is ..... that in a venturimeter.
(*a*) less than (*b*) same as
(*c*) more than
(*d*) data insufficient, cannot be predicted

43. The velocity profile for turbulent flow through a closed conduit is
(*a*) logarithmic (*b*) parabolic
(*c*) hyperbolic (*d*) linear

44. For laminar flow through a closed conduit
(*a*) $V_{max} = 2\ V_{av}$ (*b*) $V_{max} = V_{av}$
(*c*) $V_{max} = 1.5 V_{av}$ (*d*) $V_{\max} = 0.5\ V_{av}$

45. $f = 16/N_{Re}$, is valid for
(*a*) turbulent flow
(*b*) laminar flow through an open channel
(*c*) steady flow
(*d*) none of these

46. Isotropic turbulence occurs
(*a*) where there is no velocity gradient.
(*b*) at higher temperatures.
(*c*) only in Newtonion fluids.
(*d*) none of these.

47. Consider two pipes of same length and diameter through which water is passed at the same velocity. The friction factor for rough pipe is f_1 and that for smooth pipe is f_2. Pick out the correct statement.
(*a*) $f_1 = f_2$ (*b*) $f_1 < f_2$
(*c*) $f_1 > f_2$
(*d*) data not sufficient to relate f_1 & f_2

48. Bernoulli's equation for steady, frictionless, continuous flow states that the ..... at all sections is same.
(*a*) total pressure (*b*) total energy
(*c*) velocity head (*d*) none of these

49. Drag is defined as the force exerted by the
(*a*) fluid on the solid in a direction opposite to flow.
(*b*) The fluid on the solid in the direction of flow.
(*c*) The solid on the fluid.
(*d*) none of these.

50. Drag co-efficient for flow past immersed body is the ratio of.....to the product of velocity head and density.
(*a*) shear stress (*b*) shear force
(*c*) average drag per unit projected area
(*d*) none of these

51. Stoke's law is valid, when the particle Reynolds number is
(*a*) < 1 (*b*) >1
(*c*) <5 (*d*) none of these

52. Drag co-officient C_D, in Stoke's law range is given by
(*a*) $C_D = \dfrac{16}{R_{e,p}}$ (*b*) $C_D = \dfrac{24}{R_{e,p}}$
(*c*) $C_D = \dfrac{18.4}{R_{e,p}}$ (*d*) $C_D = \dfrac{0.079}{R_{e,p}^{0.25}}$

53. At low Reynolds number
(*a*) viscous forces are unimportant.
(*b*) viscous forces control.
(*c*) viscous forces control and inertial forces are unimportant.
(*d*) gravity forces control.

54. At high Reynolds number
(*a*) inertial forces control and viscous forces are unimportant.
(*b*) viscous forces predominate.
(*c*) inertial forces are unimportant and viscous forces control.
(*d*) none of these.

55. For flow of fluids through packed bed, the superficial velocity is
(*a*) less than the average velocity through channels.
(*b*) more than the average velocity through channels.
(*c*) dependent on the pressure drop across the bed.
(*d*) same as the average velocity through channels.

56. Pressure drop in a packed bed for laminar flow is given by the.....equation.
(*a*) Kozney-Karmann
(*b*) Blake-Plummer
(*c*) Leva's
(*d*) Fanning friction factor

57. Pressure drop in packed bed for turbulent flow is given by the.....equation.
(*a*) Kozney-Karman
(*b*) Blake-Plummer
(*c*) Leva's (*d*) Hagen-Poiseulle's

58. Forces acting on a particle settling in fluid are.....forces.
(*a*) gravitational & buoyant.
(*b*) centrifugal & drag.
(*c*) gravitational or centrifugal buoyant drag.
(*d*) external, drag & viscous.

59. Terminal velocity is
(*a*) a constant velocity with no acceleration.
(*b*) a fluctuating velocity.
(*c*) attained after moving one-half of total distance.
(*d*) none of these.

60. In hindered settling, the particles are
(*a*) placed farther from the wall.
(*b*) not affected by other particles and the wall.
(*c*) near each other. (*d*)none of these.

61. Drag co-efficient in hindered settling is.....that in free settling.
(*a*) less than (*b*) equal to

(*c*) not necessarily greater than
(*d*) always greater than

62. For the free settling of a spherical particle through a fluid, the slope of, $C_D - \log N_{Re}$, plot is
(*a*) 1 (*b*) –1
(*c*) 0.5 (*d*) – 0.5

63. In continuous fluidisation
(*a*) solids are completely entrained.
(*b*) the pressure drop is less than that for batch fluidisation.
(*c*) there is no entrainment of solids.
(*d*) velocity of the fluid is very small.

64. Pressure drop in a fluidised bed reactor is ..... that in a similar packed bed reactor.
(*a*) less than (*b*) more than
(*c*) same as (*d*) none of these

65. Slugging in a fluidised bed can be avoided by using
(*a*) tall narrow vessel.
(*b*) deep bed of solids.
(*c*) shallow beds of solids and proper choice of particle size.
(*d*) very large particles.

66. Minimum porosity for fluidisation is
(*a*) that corresponding to static bed.
(*b*) that corresponding to completely fluidised bed.
(*c*) the porosity of the bed when true fluidisation begins.
(*d*) less than that of the static bed.

67. In a fluidised bed reactor
(*a*) temperature gradients are very high.
(*b*) temperature is more or less uniform.
(*c*) hot spots are formed.
(*d*) segregation of the solids occurs.

68. Lower BWG means ..... of the tube.
(*a*) lower thickness (*b*) lower cross-section
(*c*) outer diameter (*d*) inner diameter

69. Cavitation occurs in a centrifugal pump when the suction pressure is
(*a*) less than the vapour pressure of the liquid at that temperature.
(*b*) greater than the vapour pressure of the liquid at that temperature.
(*c*) equal to the vapour pressure.
(*d*) equal to the developed head.

70. Cavitation can be prevented by
(*a*) suitably designing the pump.
(*b*) maintaining the suction head sufficiently greater than the vapour pressure.
(*c*) maintaining suction head = developed head.
(*d*) maintaining suction head lower than the vapour pressure.

71. Priming is needed in a.....pump.
(*a*) reciprocating (*b*) gear
(*c*) centrifugal (*d*) diaphragm

72. The general relationship between speed N, head H, power P and discharge Q for a centrifugal pump is
(*a*) $Q \propto N : H \propto N^2 : P \propto N^3$
(*b*) $Q \propto N^2 : H \propto N^3 : P \propto N$
(*c*) $Q \propto N : H \propto N^3 : P \propto N^2$
(*d*) $Q \propto N^3 : H \propto N : P \propto N^2$

73. The maximum depth from which a centrifugal pump can draw water is
(*a*) dependent on the speed of the pump.
(*b*) dependent on the power of the pump.
(*c*) 34 feet. (*d*) 150 feet.

74. Boiler feed water pump is usually a..... pump.
(*a*) reciprocating (*b*) gear
(*c*) multistage centrifugal
(*d*) diaphragm

75. Plunger pumps are used for
(*a*) higher pressure (*b*) slurries
(*c*) viscous mass (*d*) none of these

76. Molten soap mass is transported by a ..... pump.
(*a*) diaphragm (*b*) reciprocating
(*c*) gear (*d*) centrifugal

77. Pump used for the transportation of molten sodium in a fast breader reactor is a/an .....pump.
(*a*) reciprocating (*b*) plunger
(*c*) electro magnetic
(*d*) gear

78. To handle smaller quantity of fluid at higher discharge pressure, use a .....pump.
(*a*) reciprocating (*b*) centrifugal
(*c*) volute (*d*) rotary vacuum

79. The head developed by a centrifugal pump is largely determined by the

(*a*) power of the pump.
(*b*) nature of the liquid being pumped.
(*c*) angle of the vanes and the speed of the tip of the impeller.
(*d*) vapour pressure of the liquid.

80. The maximum head that can be developed by a single impeller is.....ft.
(*a*) 25 (*b*) 100
(*c*) 250 –300 (*d*) 1000

81. The actual velocity at vena-contracta for flow through an orifice from a reservoir is given by
(*a*) $C_v \cdot \sqrt{2gH}$ (*b*) $C_c \cdot \sqrt{2gH}$
(*c*) $C_d \cdot \sqrt{2}gH$ (*d*) $C_v \cdot V_a$

82. The fluid jet discharging from a 2″ diameter orifice has a diameter of 1.75″ at its vena-contracta. The co-efficient of contraction is
(*a*) 1.3 (*b*) 0.766
(*c*) 0.87 (*d*) none of these

83. The discharge through a V-notch weir varies as
(*a*) $H^{3/2}$ (*b*) $H^{1/2}$
(*c*) $H^{5/2}$ (*d*) $H^{2/3}$

84. The discharge through a rectangular weir varies as
(*a*) $H^{1/2}$ (*b*) $H^{5/2}$
(*c*) $H^{2/5}$ (*d*) $H^{3/2}$

85. Propellers are
(*a*) axial flow mixers.
(*b*) low speed impeller.
(*c*) used for mixing liquids of high viscosity.
(*d*) radial flow mixers.

86. Turbine impeller
(*a*) produces only radial current.
(*b*) produces only tangential current.
(*c*) is effective over wide range of viscosities.
(*d*) does not produce tangential current.

87. Baffles in mixing tanks are provided to
(*a*) reduce swirling and vortex formation.
(*b*) increase the structural strength of the tank.
(*c*) aid in rotational flow.
(*d*) none of these

88. Power required for mixing Newtonion fluids is a function of the
(*a*) speed of impeller, diameter of impeller & viscosity.
(*b*) density & viscosity of fluid only.
(*c*) density of fluid, viscosity of fluid & impeller dia only.
(*d*) none of these.

89. Power number is the ratio of
(*a*) drag stress to inertial stress.
(*b*) inertial stress to drag stress.
(*c*) inertial stress to gravitational stress.
(*d*) gravitational stress to drag stress.

90. Froude number is the ratio of
(*a*) shear stress to gravitational stress.
(*b*) drag stress to shear stress.
(*c*) inertial stress to shear stress.
(*d*) inertial stress to gravitational stress.

91. Froude number is not a factor
(*a*) for Reynolds number greater than 300.
(*b*) when there is no vortex formation.
(*c*) for unbaffled tank.
(*d*) none of these.

92. A pitched-blade turbine draws ..... a straight blade turbine.
(*a*) less power than
(*b*) more power than
(*c*) same power as
(*d*) data insufficient to predict

93. Scale up of agitator design requires
(*a*) geometrical similarity only.
(*b*) dynamic similarity only.
(*c*) both geometrical and dynamic similarity.
(*d*) all geometrical, dynamic and kinematic similarity.

94. Most commonly used joint in the underground pipe lines is the
(*a*) sleeve joint (*b*) coupling
(*c*) flange (*d*) expansion joint

95. The valve used for very remote and accurate control of fluid is a .....valve.
(*a*) needle (*b*) globe
(*c*) gate (*d*) butterfly

96. Check valves are used
(*a*) at high pressure.
(*b*) in bends.
(*c*) for controlling water flow.
(*d*) for unidirectional flow.

97. Which of the following facilitates close control of flow of fluids ?
(*a*) Gate valve (*b*) Globe valve
(*c*) Butterfly valve (*d*) Check valve

98. Glass pipes can be joined by
(*a*) flanges (*b*) welding
(*c*) soldering (*d*) bell and spigot joint

99. The valve commonly used in pipes larger than 2″ dia is a
(*a*) globe valve (*b*) plug-cock
(*c*) gate valve (*d*) check valve

100. A 2″ gate valve fitted in a pipe is replaced by a similar globe valve. Pressure drop in gate valve was Δp. For the same discharge, the pressure drop across globe valve is
(*a*) Δp (*b*) $< \Delta p$
(*c*) $> \Delta p$ (*d*) Δp^2

101. Co-efficient of velocity is ..... the coefficient of discharge.
(*a*) less than (*b*) more than
(*c*) equal to (*d*) not related to

102. A piezometer provided in the pipe measures
(*a*) friction factor (*b*) static pressure
(*c*) dynamic pressure
(*d*) none of these

103. Function of air vessel provided in a reciprocating pump is to
(*a*) reduce discharge fluctuation.
(*b*) reduce the danger of cavitation.
(*c*) avoid the necessity of priming.
(*d*) increase the pump efficiency.

104. Head developed by a centrifugal pump depends on its
(*a*) speed (*b*) impeller diameter
(*c*) both (*a*) and (*b*)
(*d*) neither (*a*) nor (*b*)

105. The head loss in turbulent flow in a pipe varies
(*a*) as velocity (*b*) as (velocity)^2
(*c*) inversely as the square of diameter
(*d*) inversely as the velocity

106. With increase in pump speed, its NPSH requirement
(*a*) decreases(*b*)increases
(*c*) remains unaltered
(*d*) can either increase or decrease ; depends on other factors

107. One dimensional flow implies
(*a*) flow in a straight line.
(*b*) steady uniform flow.
(*c*) unsteady uniform flow.
(*d*) a flow which does not account for changes in transverse direction.

108. In case of centrifugal fan or blower, the gas capacity varies as
(*a*) speed (*b*) (speed)^2
(*c*) (speed)^3 (*d*) (speed)$^{0.5}$

109. The continuity equation
(*a*) relates mass flow rate along a stream tube.
(*b*) relates work and energy.
(*c*) stipulates that Newton's second law of motion must be satisfied at every point in the fluid.
(*d*) none of these.

110. For a specific centrifugal air blower operating at constant speed & capacity, the power requirement and pressure vary
(*a*) directly as square of gas density.
(*b*) directly as gas density.
(*c*) directly as square root of gas density.
(*d*) inversely as gas density.

111. Foot valves are provided in the suction line of a centrifugal pump to
(*a*) avoid priming, every time we start the pump.
(*b*) remove the contaminant present in the liquid.
(*c*) minimise the fluctuation in discharge.
(*d*) control the liquid discharge.

112. Differential manometer measures the
(*a*) atmospheric pressure.
(*b*) sub-atmospheric pressure.
(*c*) pressure difference between two points.
(*d*) none of these.

113. Velocity distribution for flow between two fixed parallel plates
(*a*) varies parabolically across the section.
(*b*) is constant over the entire cross-section.
(*c*) is zero at the plates and increases linearly to the midplane.
(*d*) none of these.

114. While starting a centrifugal pump, its delivery valve should be kept
(*a*) opened. (*b*) closed.

(*c*) either opened or closed ; it does not make any difference.

(*d*) either opened or closed; depending on the fluid viscosity.

115. A centrifugal pump designed for handling water ($\mu = 1$ cp) will deliver ..... when pumping a thicker oil ($\mu = 30$ cp) .

(*a*) less head & capacity

(*b*) more head

(*c*) more capacity

(*d*) less head & more capacity

116. Path followed by water jet issuing from the bottom of a water tank will be a

(*a*) parabola (vertex being at the opening).

(*b*) hyperbola.

(*c*) horizontal straight line.

(*d*) zig-zag path (which is geometrically undefined).

117. A centrifugal pump loses prime after starting. The reason of this trouble may be

(*a*) incomplete priming.

(*b*) too high a suction lift.

(*c*) low available NPSH and air leaks in the suction pipe.

(*d*) all (*a*), (*b*), and (*c*).

118. Flow rate of high velocity flue gas discharged through a stack to the atmosphere can be most conveniently measured by a

(*a*) pitot tube (*b*) manometer

(*c*) rotameter (*d*) none of these

119. Capacity of a rotary gear pump can be varied by

(*a*) changing the speed of rotation.

(*b*) bleeding air into suction.

(*c*) bypassing liquid from the suction or discharge line .

(*d*) all (*a*), (*b*) and (*c*).

120. Maximum theoretical suction lift for water at 15°C by a centrifugal pump is 34 ft. The same for water at 90°C will be.....ft.

(*a*) 40 (*b*) 34

(*c*) 8 (*d*) 37

121. Friction factor for a hydraulically smooth pipe at $N_{Re} = 2100$ is f_1. If the pipe is further smoothened (*i.e.*, roughness is reduced), the friction factor at the same value of N_{Re}, will

(*a*) increase. (*b*) decrease.

(*c*) remain unchanged.

(*d*) increase or decrease depending on the pipe material.

122. For liquid flow through a packed bed, the superficial velocity as compared to average velocity through the channel in the bed is

(*a*) more (*b*) less

(*c*) equal

(*d*) independent of porosity

123. Vena-contracta formed during flow of a liquid through an orificemeter has

(*a*) minimum liquid cross-section.

(*b*) more diameter compared to orifice diameter.

(*c*) minimum velocity of fluid stream.

(*d*) none of these.

124. Reciprocating pumps compared to centrifugal pumps

(*a*) deliver liquid at uniform pressure.

(*b*) can handle slurries more efficiently.

(*c*) are not subject to air binding.

(*d*) can be operated with delivery valve closed.

125. A tube is specified by its

(*a*) thickness only

(*b*) outer diameter only

(*c*) thickness & outer diameter both

(*d*) inner diameter

126. For pipes that must be broken at intervals for maintenance, the connector used should be a/an

(*a*) union (*b*) tee

(*c*) reducer (*d*) elbow

127. If more than two branches of pipes are to be connected at the same point, then use a/an

(*a*) elbow (*b*) union

(*c*) tee (*d*) none of these.

128. The most economical flow control valve for use with large diameter pipes is a

(*a*) butterfly valve (*b*) globe valve

(*c*) needle valve (*d*) none of these

129. Which of the following factors does not contribute to the pressure drop in a pipeline ?

(*a*) Velocity of fluid

(*b*) Size of pipe

(*c*) Length of pipe and number of bends

(*d*) None of these

130. Which of the following can be used to create a flow of gas, where no significant compression is required ?
(*a*) Reciprocating compressor
(*b*) Blower
(*c*) Axial flow compressor
(*d*) Centrifugal compressor

131. Erosion and pits formation on the impeller of a centrifugal pump may be due to
(*a*) cavitation.
(*b*) low speed of impeller.
(*c*) its operation with delivery valve closed for considerable time after starting the pump.
(*d*) off centering of pump with motor.

132. Which of the following valves will incur maximum pressure drop for the same discharge of water ?
(*a*) Globe valve (*b*) Gate valve
(*c*) Needle valve (*d*) Butterfly valve

133. While starting an axial flow pump, its delivery valve should be kept
(*a*) open (*b*) closed
(*c*) either open or closed
(*d*) none of these

134. Identification of pipelines carrying different liquids and gases is done by the ..... of the pipe.
(*a*) diameter (*b*) colour
(*c*) altitude (*d*) none of these

135. A centrifugal pump has the following specifications :
Power = 4 H.P.; Speed = 800 rpm
Head = 8 metres
Flow = 1000 litres/minutes.
If its speed is halved, then the new head will be.....metres.
(*a*) 2 (*b*) 4
(*c*) 8 (*d*) 5.5

136. In question No. 135, the power consumed now will be.....hp.
(*a*) 0.5 (*b*) 2
(*c*) 4 (*d*) 1

137. In question No. 135, the new discharge will be.....litres/minute.
(*a*) 500 (*b*) 200
(*c*) 1000 (*d*) 750

138. Interstage coolers are provided in a multistage compressor to
(*a*) save power in compressing a given volume to a given pressure.
(*b*) cool the delivered air.
(*c*) achieve the exact delivery pressure.
(*d*) none of these.

139. Surge tanks are provided in high pressure water pipelines to
(*a*) store a definite quantity of water all the time.
(*b*) reduce the water hammer.
(*c*) facilitate easy dismantling of pipeline for cleaning and maintenance.
(*d*) none of these.

140. Pipes having diameter 14 inches or more are designated by their
(*a*) outside diameter
(*b*) inside diameter
(*c*) schedule number
(*d*) none of these

141. Disc compensators are provided in large diameter fuel gas carrying pipelines to
(*a*) keep the pipe in proper orientation.
(*b*) make the pipe joint leak-proof.
(*c*) account for contraction/expansion of pipe due to temperature changes of the surroundings.
(*d*) account for the pressure variation inside the pipeline.

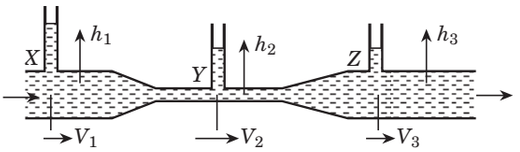
142. Nominal Pipe Size (NPS) of a pipe less than 12 inches in diameter indicates its
(*a*) inner diameter (*b*) outer diameter
(*c*) thickness
(*d*) neither inner nor outer diameter

143. The most important factor, which determines the maximum height to which water can be lifted by a pump at standard temperature is the
(*a*) barometric pressure
(*b*) speed of the impeller
(*c*) diameter of the impeller
(*d*) both (*b*) and (*c*)

144. Gear pump
(*a*) is a positive displacement pump.
(*b*) is a centrifugal pump.
(*c*) is a non-positive displacement pump.
(*d*) can be started with delivery valve closed.

145. When the water is warm, the height to which it can be lifted by a pump
(*a*) decreases due to reduced viscosity.
(*b*) decreases due to reduced vapour pressure.
(*c*) increases due to increased vapour pressure.
(*d*) decreases due to increased frictional resistance.

146. For flow through a venturi at a particular discharge, the correct relationships among heads at points *X*, *Y*, and *Z* are



(*a*) $h_1 > h_2 < h_3$ (*b*) $h_1 > h_2 > h_3$
(*c*) $h_2 < h_1 < h_3$ (*d*) $h_1 < h_2 < h_3$

147. In question No. 146 the correct relationships among velocities at point *X*, *Y* and *Z* would be
(*a*) $V_1 < V_2 < V_3$ (*b*) $V_2 > V_1$ and $V_2 > V_3$
(*c*) $V_1 > V_2 > V_3$ (*d*) none of these.

148. Multistage centrifugal pumps are generally used for
(*a*) high head.
(*b*) low head but high discharge.
(*c*) highly viscous liquid.
(*d*) slurries of high solid concentration.

149. Centrifugal pump can't be used to pump
(*a*) molten sodium (used as a coolant in Fast Breeder Reactor).
(*b*) moderately viscous vegetable oil used in soap industry.
(*c*) thick molten soap at 80°C.
(*d*) none of the above.

150. Volute type of casing is provided in a centrifugal pump to
(*a*) convert velocity head to pressure head.
(*b*) convert pressure head to velocity head.
(*c*) reduce the discharge fluctuation.
(*d*) increase the discharge.

151. A pump operating under specific conditions delivers insufficient quantity of liquid. This may be set right by
(*a*) decreasing the size of the inlet pipe.
(*b*) increasing the size of the inlet pipe.
(*c*) lowering the pump position.
(*d*) both (*b*) and (*c*).

152. Delivery of insufficient quantity of liquid by a pump may be caused by
(*a*) air leak in the inlet
(*b*) low rpm
(*c*) too high a lift (*d*) all (*a*), (*b*) and (*c*)

153. Actual lift of a pump is always less than the theoretical lift and is limited by the
(*a*) specific gravity & temperature of the liquid.
(*b*) leakage & pressure decreasing at higher elevations.
(*c*) frictional resistance through pipes, fittings & passages.
(*d*) all (*a*), (*b*) and (*c*).

154. Nominal size of the discharge pipe of a pump is usually.....the nominal size of the inlet pipe.
(*a*) smaller than (*b*) larger than
(*c*) same as (*d*) twice

155. Horsepower requirement for given pump capacity depends upon the
(*a*) specific gravity of the liquid
(*b*) suction lift
(*c*) discharge head (*d*) all (*a*) , (*b*) and (*c*)

156. Which of the following is the most common pump for pumping either raw sewage or sludge ?
(*a*) Electromagnetic pump
(*b*) Centrifugal pump
(*c*) Reciprocating pump
(*d*) Gear pump

157. The pump used for irrigation purposes is generally designed for
(*a*) large capacity & high head.
(*b*) large capacity & low head.
(*c*) small capacity & high head.
(*d*) small capacity & low head.

158. Self-priming centrifugal pump can be used for
(*a*) booster service.
(*b*) pumping liquid fertilisers (*e.g.* liquid NH_3).
(*c*) pumping industrial wastes.
(*d*) all (*a*) , (*b*) and (*c*).

159. I.D. of 1/4″ schedule 40 pipe is 0.364″. I.D. of a 1/2″ schedule 40 pipe would be .....inch
(*a*) 4.728 (*b*) 0.5
(*c*) 0.622 (*d*) 0.474

160. With increase in the schedule number of a pipe of a particular nominal size, the
(*a*) wall thickness also increases.
(*b*) I.D. of the pipe decreases.
(*c*) O.D. of the pipe remains constant.
(*d*) all (*a*), (*b*) and (*c*)

161. The nominal size of a hose pipe is specified by its
(*a*) I.D. (*b*) O.D.
(*c*) thickness (*d*) none of these

162. Fanning friction factor equation applies to the.....fluid flow.
(*a*) non-isothermal condition of
(*b*) compressible
(*c*) both (*a*) and (*b*)
(*d*) neither (*a*) nor (*b*)

163. Which of the following may be termed as a variable orifice flowmeter ?
(*a*) Rotameter (*b*) Pitot tube
(*c*) V-notch (*d*) All (*a*), (*b*) and (*c*)

164. Pressure gradient in the pipe flow is influenced by the
(*a*) diameter of pipe.
(*b*) velocity of the fluid.
(*c*) density & viscosity of the fluid.
(*d*) all (*a*), (*b*) and (*c*).

165. Check in a centrifugal pump is
(*a*) provided in the discharge line.
(*b*) generally a globe valve.
(*c*) provided to prevent liquid from backing up through the pump when the pump is turned off or accidently stops running.
(*d*) all (*a*) , (*b*) and (*c*).

166. The vent valve provided in a liquid handling centrifugal pump is
(*a*) generally a needle valve.
(*b*) used to release any gases that might be vapour locking the pump.
(*c*) helpful in easy removal of samples.
(*d*) all (*a*), and (*b*) and (*c*).

167. Cavitation in a centrifugal pump results from
(*a*) high discharge pressure
(*b*) low barometric pressure
(*c*) high discharge velocity
(*d*) high discharge rate

168. Which of the following is used for pumping crude oil from oil well ?
(*a*) Single stage centrifugal pump
(*b*) Gear pump
(*c*) Screw pump
(*d*) Duplex/triplex reciprocating pump

169. Which of the following is most prone to pulsating discharge flow ?
(*a*) Centrifugal pump
(*b*) Reciprocating pump
(*c*) Gear pump
(*d*) Axial flow pump

170. A centrifugal pump designed to pump water is employed to pump a more viscous oil. In the later case, the pump
(*a*) develops a lower head.
(*b*) capacity is reduced.
(*c*) requires more power.
(*d*) all (*a*), (*b*) and (*c*).

171. With a constant diameter impeller of a centrifugal pump
(*a*) its capacity varies directly as the square of speed.
(*b*) head varies as the square of speed.
(*c*) horsepower input varies as the square of speed.
(*d*) head varies as the speed.

172. At a constant speed of the centrifugal pump its ..... the impeller diameter.
(*a*) capacity varies directly with
(*b*) head varies as the square of
(*c*) horsepower varies as the cube of
(*d*) all (*a*) , (*b*) and (*c*)

173. Viscosity of a liquid decreases ..... with rise in temperature.
(*a*) exponentially (*b*) linearly
(*c*) logarithmically(*d*) none of these

174. Pick out the Hagen-Poiseulle's equation.
(*a*) $\frac{\Delta p}{\rho} = 4f \cdot \frac{L}{D} \cdot \frac{V^2}{2 g_c}$
(*b*) $\Delta p = 32 \frac{\mu LV}{g_c . D^2}$
(*c*) $\frac{\Delta p}{L} = 150 \frac{(1 - \varepsilon)}{\varepsilon^3} \cdot \frac{\mu . V_0^2}{g_c^2 D_p}$

(*d*) $\frac{\Delta p}{L} = 1.75 \frac{(1-\varepsilon)}{\varepsilon^3} \cdot \frac{\rho V_0^2}{g_c \cdot D_p}$

175. Equivalent length of a pipe fitting is
(*a*) dependent on Reynolds number.
(*b*) independent of Reynolds number.
(*c*) dependent on the length of the pipe.
(*d*) none of these.

176. Creeping flow around a sphere is defined, when particle Reynolds number is
(*a*) < 2100 (*b*) < 0.1
(*c*) > 2.5 (*d*) < 500

177. Pressure drop (Δp) for a fluid flowing in turbulent flow through a pipe is a function of velocity (V) as
(*a*) $V^{1.8}$ (*b*) $V^{-0.2}$
(*c*) $V^{2.7}$ (*d*) V^2

178. A fluid $\left(\frac{\mu}{\rho} = 0.01 \text{ cm}^2/\text{sec}\right)$ is moving at critical flow condition ($N_{Re} = 2100$) through a pipe of dia 3 cms. Velocity of flow is.....cm/sec.
(*a*) 7 (*b*) 700
(*c*) 7000 (*d*) 630

179. Multistage compressors are used in industry, because they
(*a*) reduce the cost of compressor.
(*b*) reduce the size requirement.
(*c*) resemble closely to isothermal compression.
(*d*) are easy to control.

180. For pumping slurry, one can use a ..... pump.
(*a*) reciprocating (*b*) diaphargm
(*c*) centrifugal (*d*) pneumatic

181. The pressure head of a flow meter remains constant for
(*a*) venturimeter (*b*) orificemeter
(*c*) rotameter (*d*) pitot tube

182. A mercury (specific gravity = 13.6) manometer connected across an orificemeter fitted in a pipe shows a manometer reading of 2 cms. If the manometer liquid is changed to carbon tetrachloride (specific gravity = 1.6), then for the same flow rate of water the new manometer reading will be.....cms.
(*a*) 17 (*b*) 42
(*c*) 84 (*d*) 1.8

183. For very low pressure and high discharge rate, the compressor used is a/an. .....compressor.
(*a*) axial (*b*) reciprocating
(*c*) rotary (*d*) none of these

184. In a dry packed bed, the pressure drop will be changed by increasing the flow rate as
(*a*) $V^{1.8}$ (*b*) $V^{-0.8}$
(*c*) V (*d*) V^{-1}

185. Reynolds number for water flow through a tube of I.D. 5 cm is 1500. If a liquid of 5 centipoise viscosity and 0.8 specific gravity flows in the same pipe at the same velocity, then the pressure drop will
(*a*) increase (*b*) decrease
(*c*) remain same
(*d*) data insufficient to predict pressure drop

186. A fluid is pumped at the rate of 10 lb/sec to a height of 55 ft. The horse power required is.....hp.
(*a*) 1 (*b*) 10/55
(*c*) 5.5 (*d*) 1/55

187. A liquid is pumped at the rate of 600 litres using 1000 rpm. If the rpm is changed to 1100, the liquid pumped is.....litres.
(*a*) 600 (*b*) 660
(*c*) 1.1 (*d*) 60

188. For the same flow rate of a fluid, the pressure drop is the least for
(*a*) venturimeter (*b*) orificemeter
(*c*) flow-nozzle (*d*) Δp is same for all

189. Two fluids are flowing through two similar pipes of the same diameter. The Reynold's number is same. For the same flow rate if the viscosity of a fluid is reduced to half the value of the first fluid, the pressure drop will
(*a*) increase (*b*) decrease
(*c*) remain unchanged
(*d*) data insufficient to predict relative pressure drop.

190. Net positive suction head (NPSH) of a centrifugal pump must be
(*a*) greater than the vapour pressure of the liquid.
(*b*) less than the vapour pressure of the liquid.

(*c*) equal to the vapour pressure of the liquid.
(*d*) less than barometric pressure.

191. A centrifugal pump used to pump water is used to pump an oil with specific gravity of 0.8 at the same rate. The power consumption will now
(*a*) increase (*b*) decrease
(*c*) remain same
(*d*) data insufficient to predict

192. Assuming flow to be laminar, if the diameter of the pipe is halved, then the pressure drop will
(*a*) increase (*b*) decrease
(*c*) remain same (*d*) be quadrupled

193. For the transfer of solution of thick slurry, the pump used is a.....pump.
(*a*) reciprocating (*b*) gear
(*c*) diaphragm (*d*) centrifugal

194. Pick out the Kozney-Karman equation (valid for low N_{Re}) for fluid flow through a packed bed of solids.
(*a*) $\frac{\Delta p}{\rho} = 4f \cdot \frac{L}{D} \cdot \frac{V^2}{2 g_c}$
(*b*) $f_p = \frac{150 (1 - \varepsilon)}{N_{Re}} + 1.75$
(*c*) $\frac{- \Delta p \cdot g_c \cdot D^2_p \cdot \varepsilon^3}{L \cdot \overline{V}_0 \cdot \mu (1 - \varepsilon)^2} = 150$
(*d*) $\frac{- \Delta p}{\delta \cdot L} \cdot \frac{g_c}{V_0^2} \cdot \frac{D_p \cdot \varepsilon^3}{1 - \varepsilon} = 1.75$

195. Pick out the Blake–Plummer equation (valid for large N_{Re}) for fluid flow through beds of solids from the alternatives given in the question. No. 194.

196. When the pipe Reynold's number is 6000, the flow is generally
(*a*) viscous (*b*) laminar
(*c*) turbulent (*d*) transition

197. Diaphragm pumps are used to transport
(*a*) solids (*b*) liquids
(*c*) fluids (*d*) slurries

198. Cocks are used to control
(*a*) water (*b*) any liquid
(*c*) solids (*d*) none of these

199. Check valve is used for.....flow.
(*a*) very precise control of
(*b*) unidirectional
(*c*) multidirectional
(*d*) none of these

200. Nominal size of a pipe is an indication of its.....diameter.
(*a*) inner (*b*) outer
(*c*) approximate (*d*) none of these

201. In power law, $\zeta = A \left(\frac{du}{dy} \right)^n + B$, if $n = 1$ and $B \neq 0$, then the fluid is
(*a*) Newtonian (*b*) dilatant
(*c*) thixotropic (*d*) rheopectic

202. Bernoulli's equation accounts for the
(*a*) various momentums
(*b*) various masses
(*c*) different forms of mechanical energy
(*d*) none of these

203. Bernoulli's equation is dependent on the
(*a*) first law of thermodynamics.
(*b*) third law of thermodynamics.
(*c*) law of conservation of momentum.
(*d*) none of these.

204. Cavitation in a pump creates so many undesirable effects. Out of the following, which is not an undesirable effect created by cavitation ?
(*a*) Decrease in effect
(*b*) Increase in thrust
(*c*) Develops noise
(*d*) Develops high pressure

205. A rotameter works on the principle of.....pressure drop.
(*a*) constant (*b*) variable
(*c*) both (*a*) & (*b*) (*d*) neither (*a*) nor (*b*)

206. Enamels and paints are generally ..... fluid.
(*a*) reheopectic (*b*) pseudo-plastic
(*c*) thixotropic (*d*) dilatant

207. For ideally incompressible fluid, the Mach number will be
(*a*) 1.5 (*b*) 1
(*c*) 0 (*d*) 5

208. Select the correct statement.
(*a*) The discharge through a venturimeter depends upon Δp only and is independent of orientation of the meter.
(*b*) A venturimeter with a given gage difference discharges at a greater rate, when the flow is vertically downward through it, than when the flow is vertically upward.

(*c*) For a given pressure difference, the discharge of gas is greater through a venturimeter, when compressibility is taken into account, than when it is neglected.

(*d*) The overall pressure loss is the same in a given pipe line, whether a venturimeter or a nozzle with the same throat dia is used.

209. Select the correct practical example of steady non-uniform flow.

(*a*) Motion of water around a ship in a lake.

(*b*) Motion of river around bridge piers.

(*c*) Steadily decreasing flow through a reducing section.

(*d*) Steadily increasing flow through a pipe.

210. A streamline is

(*a*) the line connecting the mid-points of flow cross-sections.

(*b*) defined for uniform flow only.

(*c*) drawn normal to the velocity vector at every point.

(*d*) always the path of a particle.

211. In which of the following cases, it is possible for flow to occur from low pressure to high pressure ?

(*a*) Flow of liquid upward in a vertical pipe.

(*b*) Flow through a converging section.

(*c*) Flow of air downward in a pipe.

(*d*) Impossible in a constant cross-section conduit.

212. The head loss in turbulent flow in a pipe varies

(*a*) directly as the velocity.

(*b*) inversely as the square of the velocity.

(*c*) approximately as the square of the velocity.

(*d*) inversely as the square of the diameter.

213. The continuity equation in ideal fluid flow states that

(*a*) net rate of inflow into any small volume must be zero.

(*b*) energy is not constant along a streamline.

(*c*) energy is constant along a streamline.

(*d*) there exists a velocity potential.

214. Which of the following is a dimensionless parameter ?

(*a*) Angular velocity

(*b*) Specific weight

(*c*) Kinematic viscosity

(*d*) None of these

215. Which of the following is not a dimensionless parameter ?

(*a*) Pressure-co-efficient

(*b*) Froude number

(*c*) Kinematic viscosity

(*d*) Weber number

216. The pressure co-efficient is the ratio of pressure forces to.....forces.

(*a*) viscous (*b*) inertial

(*c*) gravity (*d*) surface tension

217. In laminar flow through a round tube, the discharge varies

(*a*) linearly as the viscosity.

(*b*) inversely as the pressure drop.

(*c*) inversely as the viscosity.

(*d*) as the square of the radius.

218. The Prandtl mixing length is

(*a*) zero at the pipe wall and is a universal constant.

(*b*) independent of radial distance from the pipe axis.

(*c*) independent of the shear stress.

(*d*) useful for computing laminar flow problems.

219. Boundary layer separation is caused by the

(*a*) reduction of pressure to vapour pressure.

(*b*) boundary layer thickness reducing to zero.

(*c*) adverse pressure gradient.

(*d*) reduction of pressure gradient to zero.

220. Boundary layer separation occurs the when

(*a*) pressure reaches a minimum.

(*b*) cross-section of the channel is reduced.

(*c*) valve is closed in a pipeline.

(*d*) velocity of sound is reached.

221. The terminal velocity of a small sphere settling in a viscous fluid varies as the

(*a*) first power of its dimeter.

(*b*) inverse of the fluid viscosity.

(*c*) inverse square of the diameter.

(*d*) square of the difference in specific weights of solid & fluid.

222. The losses in open channel flow generally vary as the
(*a*) inverse of the roughness.
(*b*) first power of the roughness.
(*c*) square of the velocity.
(*d*) inverse square of hydraulic radius.

223. In turbulent flow, a rough pipe has the same friction factor as a smooth pipe
(*a*) in the zone of complete turbulence.
(*b*) when the roughness projections are much smaller than the thickness of the laminar film.
(*c*) everywhere in the transition zone.
(*d*) when the friction factor is independent of the Reynold's number.

224. In the complete turbulence zone (in rough pipes), the
(*a*) rough and smooth pipes have the same friction factor.
(*b*) laminar film covers the roughness projections.
(*c*) friction factor depends upon N_{Re} only.
(*d*) friction factor is independent of the relative roughness.

225. The length of the tube necessary for the boundary layer to reach the centre of the tube and for fully developed flow to be established is called the.....length.
(*a*) equivalent (*b*) transition
(*c*) Prandtl mixing
(*d*) none of these

226. Transition length for a turbulent fluid entering into a pipe is around ..... times the pipe diameter.
(*a*) 5 (*b*) 50
(*c*) 500 (*d*) 1000

227. If the discharge of a centrifugal pump is throttled, then its suction lift
(*a*) increases (*b*) decreases
(*c*) remains unchanged
(*d*) data insufficient to predict

228. Remote control valve is a.....valve.
(*a*) gate (*b*) butterfly
(*c*) needle (*d*) globe

229. Purpose of relief valve in a reciprocating pump is to
(*a*) protect the pump against developing excessive pressure.
(*b*) facilitate unidirectional flow of liquid.
(*c*) reduce the discharge pressure.
(*d*) control the rate of discharge.

230. Centrifugal compressors compared to reciprocating compressors
(*a*) require less space.
(*b*) have quieter operation.
(*c*) have lower operating costs.
(*d*) all (*a*), (*b*) and (*c*).

231. Which of the following produces maximum pressure difference for transportation of gases ?
(*a*) Vaccum pumps
(*b*) Blowers
(*c*) Fans (*d*) Compressors

232. With increase in molecular weight of the gas, the head developed by a centrifugal compressor will
(*a*) decrease (*b*) increase
(*c*) remain same (*d*) unpredictable

233. Horsepower increase of a centrifugal gas compressor without altering the volumetric flow rate will ..... the gas discharge pressure.
(*a*) increase (*b*) decrease
(*c*) not change
(*d*) exponentially decrease

234. The fluid property which matters for falling rain drops to acquire spherical shape is its
(*a*) pressure (*b*) height of descend
(*c*) viscosity (*d*) surface tension

235. In a stabilised soap bubble, pressure inside it compared to external pressure is
(*a*) more (*b*) less
(*c*) same
(*d*) unpredictable

236. For an incompressible fluid, the bulk modulus of elasticity is
(*a*) 5 kg/m^3 (*b*) ∞ N/m^2
(*c*) 1 N (*d*) 0 N/m^2

237. Correction for capillary effect in manometers (used for pressure measurement) need not be applied, if diameter of the manometer tube is.....mm.
(*a*) < 4 (*b*) > 4
(*c*) > 12.5 (*d*) < 10

238. The bulk modulus of elasticity of a liquid
(*a*) is zero for incompressible liquid.

(*b*) decreases with pressure.
(*c*) is independent of temperature & pressure.
(*d*) increases with pressure.

239. Choose the correct set of dimensions of viscosity that are equivalent.
(*a*) $FL^{-2}T$, $ML^{-1}T^{-1}$
(*b*) $FL^{-2}T$, $ML^{-1}T^{-1}$
(*c*) $ML^{-1}T^{-3}$, $F^{-1}L^{2}T$
(*d*) $F^{-1}L^{2}T^{-1}$, MLT^{-3}

where, F, M, L, T are dimensions for force, mass, length and time respectively.

240. If two capillary tubes of dia 0.5 mm and 1 mm are dipped in a pot containing mercury, then the rise of mercury is
(*a*) same in both the tubes.
(*b*) greater in 1 mm dia tube.
(*c*) greater in 0.5 mm dia tube.
(*d*) zero in both the tubes.

241. Which of the following is a Newtonian fluid?
(*a*) Rubber latex (*b*) Sewage sludge
(*c*) Quicksand
(*d*) Non-colloidal solution

242. Which law/principle of solid mechanics is similar/equivalent to Newton's law of viscosity in fluid mechanics ?
(*a*) Archimedes principle.
(*b*) Newton's second law of motion.
(*c*) Hooke's law.
(*d*) Newton's third law of motion.

243. Which is the correct relationship for a centrifugal pump ?
(*a*) $D = 1840\ H^{0.5}/N$
(*b*) $D = 1840\ N/H^{0.5}$
(*c*) $H = 1840\ D^{0.5}/N$
(*d*) $D = 1840\ H/N$

where, D = Impeller diameter, inches
H = Head developed, ft of liquid pumped
N = Speed of pump, rpm.

244. The schedule number of a pipe is an indication of its
(*a*) size (*b*) roughness
(*c*) material density
(*d*) wall thickness

245. The co-efficient of discharge of an orificemeter is a function of
(*a*) Reynolds number at the orifice.
(*b*) ratio of orifice dia to pipe dia.
(*c*) both (*a*) and (*b*).
(*d*) none of the above parameters, and has a constant value of 0.61.

246. Volume of liquid displaced by a floating body is equivalent to its
(*a*) own weight (*b*) submerged weight
(*c*) own volume (*d*) submerged volume

247. Which of the following denotes the effect of compressibility in fluid flow ?
(*a*) Weber number (*b*) Mach number
(*c*) Euler number (*d*) Reynolds number

248. Momentum correction factor used in fluid flow problems accounts for the
(*a*) change in direction of flow.
(*b*) change in total energy.
(*c*) change in pressure.
(*d*) non uniform direction of velocities at inlet & outlet sections.

249. Pascal law is not applicable for a/an ..... fluid.
(*a*) accelerating frictionless
(*b*) static
(*c*) uniformly moving
(*d*) none of these

250. What is the value of Fanning friction factor '*f* ' for smooth pipe at $N_{Re} = 10^6$ approximately ?
(*a*) 0.003 (*b*) 0.01
(*c*) 0.1 (*d*) 0.3

251. The distribution of shear stress in a stream of fluid in a circular tube is
(*a*) linear with radius for turbulent flow only.
(*b*) linear with radius for laminar flow only.
(*c*) linear with radius for both laminar & turbulent flow.
(*d*) parabolic with radius for both laminar & turbulent flow.

252. What is the unit of kinematic viscosity in SI unit ?
(*a*) M^2/sec (*b*) N/m^2 . sec
(*c*) Kg . sec/m (*d*) None of these

253. One dimensional fluid flow implies the
(*a*) flow in straight lines only.
(*b*) uniform flow.

(*c*) steady uniform flow.
(*d*) flow in which transverse components are zero.

254. The discharge through a semi-circular weir varies as
(*a*) H (*b*) H^2
(*c*) $H^{3/2}$ (*d*) $H^{1/2}$
where, H = Head of liquid.

255. A pressure of 10 m head of water is equivalent to ..... kN/m^2.
(*a*) 98 (*b*) 147
(*c*) 196 (*d*) 49

256. Differential manometer measures the
(*a*) absolute pressure
(*b*) gauge pressure
(*c*) pressure difference
(*d*) pressure gradient

257. The unit of dynamic viscosity in SI unit is
(*a*) kg/m . sec (*b*) N/m^2
(*c*) m^2/sec. (*d*) m/N . sec.

258. Pressure co-efficient is the ratio of pressure forces to.....forces.
(*a*) gravity (*b*) inertial
(*c*) viscous (*d*) none of these

259. Gradually varied flow in open channel is a/an.....flow.
(*a*) steady uniform (*b*) steady non-uniform
(*c*) unsteady uniform
(*d*) unsteady non-uniform

260. Liquid delivery by centrifugal pump starts, only when the head developed by it is equal to the .... head.
(*a*) manometric (*b*) static
(*c*) total (*d*) friction

261. Power required by a centrifugal pump is proportional to
(*a*) N^2D^3 (*b*) ND^2
(*c*) N^2D (*d*) N^3D^5
where, D = diameter, N = r.p.m.

262. Specific speed of a centrifugal pump relates it with another pump having the
(*a*) dynamic similarity
(*b*) same efficiency
(*c*) same speed
(*d*) geometrical similarity

263. Which of the following quantities are computed by using the hydraulic radius for non-circular ducts ?
(*a*) Velocity and relative roughness.
(*b*) Head loss and velocity.
(*c*) Reynold number, relative roughness and head loss.
(*d*) Reynolds number and friction factor.

264. What is the maximum theoretical suction lift (metres) of a reciprocating pump ?
(*a*) 5 (*b*) 10
(*c*) 50 (*d*) 100

265. In case of a centrifugal pump, the ratio of total delivered pressure to pressure developed with the impeller is called the..... efficiency.
(*a*) manometric (*b*) mechanical
(*c*) volumetric (*d*) overall

266. A piezometer opening measures the .... fluid pressure.
(*a*) static (*b*) undisturbed
(*c*) total (*d*) dynamic

267. An ideal fluid is
(*a*) non-viscous (*b*) incompressible
(*c*) both (*a*) & (*b*) (*d*) neither (*a*) & (*b*)

268. What is the speed of sound (m/sec) in ordinary water ?
(*a*) 1500 (*b*) 330
(*c*) 1000 (*d*) 3000

269. A floating/submerged body is always stable, if its centre of gravity
(*a*) lies above its centre of buoyancy.
(*b*) and centre of buoyancy coincide.
(*c*) lies below its centre of buoyancy.
(*d*) lies above its meta centre.

270. The pressure at a point in a fluid is not the same in all directions, when the fluid is viscous and
(*a*) moving (*b*) static
(*c*) cold (*d*) hot

271. Which of the following is not dimensionless?
(*a*) Froude number (*b*) Kinematic viscosity
(*c*) Pressure co-efficient
(*d*) None of these

272. The speed of sound in an ideal gas varies as the
(*a*) temperature (*b*) pressure
(*c*) density (*d*) none of these

273. The Navier-Stokes equation deals with the law of conservation of
(*a*) mass (*b*) energy
(*c*) both (*a*) & (*b*) (*d*) momentum

274. A double acting reciprocating pump compared to a single acting pump (of almost same size working under same pressure levels) would give almost double
(*a*) head (*b*) discharge
(*c*) efficiency (*d*) none of these

275. Which of the following pipe bends will incur the largest head loss ?
(*a*) U-bend (*b*) 30° bend
(*c*) 45° bend (*d*) 90° bend

276. Air vessel provided in a reciprocating pump is for
(*a*) increasing the acceleration head.
(*b*) making the friction in pipe uniform.
(*c*) decreasing the acceleration head.
(*d*) none of these.

277. Two dimensional stream function
(*a*) relates velocity and pressure.
(*b*) is constant along a stream line.
(*c*) is constant along an equipotential surface.
(*d*) none of these.

278. Specific speed of a centrifugal pump depends upon the..... head.
(*a*) suction (*b*) delivery
(*c*) manometric (*d*) none of these

279. The specific speed of a pump is defined as the speed of a unit of such a size, that it
(*a*) delivers unit discharge at unit head.
(*b*) requires unit power for unit head.
(*c*) delivers unit discharge at unit power.
(*d*) none of these.

280. Acceleration head in a reciprocating pump
(*a*) increases the work done during delivery stroke.
(*b*) decreases the work done during suction stroke.
(*c*) does not change the work requirement of the pump.
(*d*) increases the work done during suction stroke.

281. The normal stress is the same in all directions at a point in a fluid, when the fluid is
(*a*) non-viscous. (*b*) incompressible.
(*c*) both (*a*) and (*b*).
(*d*) having no motion of one fluid layer relative to the other.

282. Cavitation in a centrifugal pump can be avoided by keeping the
(*a*) inlet pressure high
(*b*) outlet pressure low
(*c*) inlet pressure low
(*d*) outlet pressure high

283. A relief valve
(*a*) provides back pressure for a cylinder.
(*b*) unloads a pump.
(*c*) is a directional control valve.
(*d*) none of these.

284. Design of the casing of centrifugal pump should be such as to minimise the
(*a*) back flow through impeller
(*b*) loss of kinetic head
(*c*) loss of static head
(*d*) none of these

285. Which of the following assumptions enables the Euler's equation of motion to be integrated ?
(*a*) The fluid is incompressible.
(*b*) The fluid is non-viscous.
(*c*) The continuity equation is satisfied.
(*d*) The flow is rotational and incompressible.

286. Centrifugal pump is normally classified on the basis of the
(*a*) rpm. (*b*) type of casing.
(*c*) impeller blade angle.
(*d*) number of blades in impeller.

287. The rate of change of moment of momentum represents the..... by the fluid.
(*a*) torque applied (*b*) force exerted
(*c*) work done (*d*) power developed

288. In parallel pipe problems, the
(*a*) head loss is the same through each pipe.
(*b*) discharge is the same through all the pipes.
(*c*) total head loss is equal to the sum of the head losses through each pipe.
(*d*) none of these.

289. The speed of a sound wave in a gas is analogous to the speed of
(*a*) an elementary wave in an open channel.

(*b*) flow in an open channel.
(*c*) a disturbance travelling upstream in moving fluid.
(*d*) none of these.

290. Foot valves provided in pumps are .....valves.
(*a*) relief (*b*) three/four way
(*c*) pressure reducing
(*d*) directional control

291. A hydraulic ram acts as a/an ..... pump.
(*a*) centrifugal (*b*) reciprocating
(*c*) impulse (*d*) parallel cylinder

292. Various efficiencies of a centrifugal pump are related as
(*a*) $\eta_{ma} \times \eta_m \times \eta_v = \eta_o$
(*b*) $\eta_m = \eta_v \cdot \eta_{ma}$
(*c*) $\eta m_a = \eta_m \times \eta_v$
(*d*) $\eta_v = \eta_m \times \eta_{ma}$
where, η_m = mechanical efficiency
η_v = volumetric efficiency.
η_{ma} = manometric efficiency
η_o = overall efficiency

293. A centrifugal pump is called a turbine pump, if it is having a
(*a*) turbine type impeller.
(*b*) vaned diffusion casing.
(*c*) rotating vaned volute.
(*d*) none of these.

294. Euler's equation of motion states, that at every point, the
(*a*) fluid momentum is constant.
(*b*) force per unit mass equals acceleration.
(*c*) rate of mass outflow is equal to the rate of mass inflow.
(*d*) none of these.

295. A mixed flow centrifugal pump
(*a*) employs such an impeller, through which the flow is a combination of radial & axial flow.
(*b*) mixes the two fluids before pumping them.
(*c*) pumps the two fluids separately and then mixes them.
(*d*) employs impellers in both the radial & axial directions.

296. The blades of a centrifugal impeller are said to be curved forward, if the ..... of the motion of impeller blades.
(*a*) inlet tip of a blade curves in a direction opposite to that
(*b*) outlet tip of a blade curves in a direction opposite to that
(*c*) inlet tip of a blade is towards the direction
(*d*) outlet tip of a blade is towards the direction

297. The temperature in isentropic flow
(*a*) does not depend on Mach number.
(*b*) depends on Mach number only.
(*c*) cannot drop and then increase again downstream.
(*d*) none of these.

298. Which of the following two quantities when same, makes one pipe system equivalent to another pipe system ?
(*a*) Head & discharge
(*b*) Length & discharge
(*c*) Length & diameter
(*d*) Friction factor & diameter.

299. During ageing of fluid carrying pipes, the
(*a*) pipe becomes smoother with use.
(*b*) friction factor increases linearly with time.
(*c*) absolute roughness decreases with time.
(*d*) absolute roughness increases linearly with time.

300. What is the co-efficient of contraction, if a fluid jet discharging from a 50 mm diameter orifice has a 40 mm diameter at its vena-contracta ?
(*a*) 0.64 (*b*) 1.65
(*c*) 0.32 (*d*) 0.94

301. Pick out the correct statement pertaining to the flow through a converging–diverging tube.
(*a*) The value of Mach number is always unity at the throat.
(*b*) No shock wave develops in the tube when the Mach number at exit is greater than unity.
(*c*) Throughout the converging portion of the tube, the density increases in the downstream direction.
(*d*) none of these.

302. Purpose of hydraulic accumulator is to

(*a*) ensure intermittant supply of hydraulic pressure.
(*b*) increase the pressure and store/ accumulate it.
(*c*) accumulate pressure to increase force.
(*d*) generate high pressure to operate hydraulic machines like cranes, lifts, presses etc.

303. The simple pitot tube does not measure the
(*a*) static pressure.
(*b*) dynamic pressure.
(*c*) velocity at the stagnation point.
(*d*) all (*a*), (*b*) and (*c*).

304. For steady ideal fluid flow, the Bernoulli's equation states that the
(*a*) velocity is constant along a stream line.
(*b*) energy is constant throughout the fluid
(*c*) energy is constant along a stream line, but may vary across stream lines
(*d*) none of these

305. The dimension of kinematic viscosity is
(*a*) $ML^{-2}T^{-1}$ (*b*) L^2T^{-1}
(*c*) $ML^{-2}T^{-2}$ (*d*) none of these

306. An equipotential line is ..... to the velocity vector at every point.
(*a*) normal (*b*) normal
(*c*) tangential (*d*) none of these

307. The dimension of dynamic viscosity is
(*a*) $ML^{-1}T^{-1}$ (*b*) L^2T^{-1}
(*c*) LT^{-2} (*d*) $ML^{-1}T^{-2}$

308. A stream line is
(*a*) fixed in space in steady flow.
(*b*) always the path of particle.
(*c*) drawn normal to the velocity vector at every point.
(*d*) a line connecting the mid points of flow cross-section.

309. Volute of a centrifugal pump should be designed in a fashion, such that the
(*a*) kinetic head gets converted into static head.
(*b*) moving stream gradually reduces velocity.
(*c*) mean velocity remains constant.
(*d*) none of these.

310. The continuity equation
(*a*) is independent of the compressibility of the fluid.
(*b*) is dependent upon the viscosity of the fluid.
(*c*) represents the conservation of mass.
(*d*) none of these.

311. Priming of a centrifugal pump is done to
(*a*) increase the mass flow rate of fluid.
(*b*) develop effective pressure rise by the pump.
(*c*) avoid chances of separation inside the impeller.
(*d*) none of these.

312. The curve of metacentre for a floating body ..... the curve of buoyancy.
(*a*) is always below (*b*)is the evolute of
(*c*) intersects at right angle
(*d*) is tangential to

313. The Stoke's stream function applies to the
(*a*) irrotational flow only.
(*b*) ideal/non-viscous fluids only.
(*c*) cases of axial symmetry.
(*d*) none of these.

314. Capacity of a hydraulic accumulator is defined in terms of maximum
(*a*) amount of energy stored.
(*b*) flow rate through accumulator.
(*c*) rate of falling of ram.
(*d*) volume available in the cylinder.

315. Choking in case of pipe flow means that a
(*a*) specified mass flow rate can not be achieved.
(*b*) valve is closed in the line.
(*c*) restriction in flow cross-section area occurs.
(*d*) none of these.

316. If '*x*' is the depth of flow in an open channel of large width, then the hydraulic radius is equal to
(*a*) x (*b*) $x/2$
(*c*) $x/3$ (*d*) $2x/3$

317. A hydraulic accumulator comprises of
(*a*) a storage device and a control valve.
(*b*) a cylinder and a plunger.
(*c*) two pistons and two cylinders.
(*d*) a storage tank and a ram pump.

318. Hydraulic diameter for non-circular ducts is equal to ..... times the area of flow divided by the perimeter.
(*a*) two (*b*) three
(*c*) four (*d*) eight

319. The distance between metacentre and ..... is called metacentric height.
(*a*) water surface (*b*) centre of gravity
(*c*) centre of buoyancy
(*d*) none of these

320. The line of action of the buoyant force acts through the
(*a*) centroid of the displaced volume of fluid.
(*b*) centre of gravity of a submerged body.
(*c*) centroid of the volume of any floating body.
(*d*) none of these.

321. The dimension of surface tension is
(*a*) ML^{-2} (*b*) MT^{-2}
(*c*) MLT^{-2} (*d*) $ML^{-2}T$

322. Steady fluid flow occurs, when the derivative of flow variables satisfy the following condition.
(*a*) $\frac{\partial}{\partial s} = 0$ (*b*) $\frac{\partial}{\partial t} = 0$
(*c*) $\frac{\partial}{\partial s} =$ constant (*d*) $\frac{\partial}{\partial t} =$ constant

323. Uniform fluid flow occurs, when the derivative of the flow variables satisfy the following condition.
(*a*) $\frac{\partial}{\partial t} = 0$ (*b*) $\frac{\partial}{\partial t} =$ constant
(*c*) $\frac{\partial}{\partial s} = 0$ (*d*) $\frac{\partial}{\partial s} =$ constant

324. The pitot static tube does not measure the.....pressure.
(*a*) static (*b*) total
(*c*) difference in static & dynamic
(*d*) all (*a*), (*b*) and (*c*)

325. In deriving Bernoulli's equation, fluid is assumed to be
(*a*) incompressible, frictionless, steady, along a streamline.
(*b*) uniform, steady, incompressible, along a streamline.
(*c*) steady, density being pressure dependent, frictionless.
(*d*) none of these.

326. The ratio of actual discharge to theoretical discharge through an orifice is equal to
(*a*) $C_c \cdot C_v$ (*b*) $C_c \cdot C_d$
(*c*) $C_v \cdot C_d$ (*d*) C_d / C_v

327. For flow through an orifice from a reservoir, the actual velocity at the vena contracta is given by
(*a*) $\sqrt{2gh}$ (*b*) $C.V. \sqrt{2gh}$
(*c*) $C_d \sqrt{2gh}$ (*d*) $C_c \sqrt{2gh}$

328. The discharge through a venturimeter depends upon
(*a*) pressure drop only.
(*b*) its orientation.
(*c*) co-efficient of contraction only.
(*d*) none of these.

329. Pick out the correct statement pertaining to venturimeter.
(*a*) A venturimeter with a fixed pressure drop discharges more, when the flow is vertically downward, than when the flow is vertically upward.
(*b*) The co-efficient of contraction of a venturimeter is always unity.
(*c*) For a fixed pressure drop, the discharge of a gas through a venturimeter is greater, when compressibility is taken into account, than when it is neglected.
(*d*) none of these.

330. The fluid in which the shearing stress within it is proportional to the velocity gradient across the sheared section, is called a.....fluid.
(*a*) Bingham (*b*) perfect
(*c*) Newtonion (*d*) none of these

331. Potential function is applicable only for ..... flow.
(*a*) irrotational (*b*) turbulent
(*c*) steady (*d*) none of these

332. The velocity distribution in direction normal to the direction of flow in plane Poiseuille flow is
(*a*) hyperbolic (*b*) parabolic
(*c*) linear (*d*) none of these

333. Which law is followed by the velocity distribution in the turbulent boundary layer?
(*a*) Parabolic law (*b*) Linear law
(*c*) Logarithmic law
(*d*) None of these

334. Pressure drag does not depend upon the
(*a*) roughness of surface of the body.
(*b*) pressure of main flow only.
(*c*) length of the body in flow direction.
(*d*) all (*a*), (*b*) and (*c*)

335. The ratio of width to depth for the most economical rectangular section in open channel flow is
(*a*) 0.5 (*b*) 1
(*c*) 1.5 (*d*) 2

336. Weber number is the ratio of inertial force to ..... force.
(*a*) surface tension (*b*) gravity
(*c*) viscous (*d*) elastic

337. The energy equation, $E + \frac{P}{\rho} + \frac{V^2}{2g} + gZ$ = constant (E = internal energy/mass), is applicable to
(*a*) perfect gases only.
(*b*) isothermal flow of gases.
(*c*) adiabatic unsteady flow of gases.
(*d*) all compressible fluids.

338. C_p/C_v is termed as
(*a*) adiabatic constant
(*b*) Mach number
(*c*) Weber number (*d*) Prandtl number

339. Specific speed for a centrifugal pump is
(*a*) $\frac{N\sqrt{Q}}{H^{3/4}}$ (*b*) $\frac{N\sqrt{Q}}{H^{2/3}}$
(*c*) $\frac{N^3D^5}{H^{1/3}}$ (*d*) $\frac{N\sqrt{Q}}{H}$

340. Purpose of air lift pump is to
(*a*) compress air.
(*b*) lift compressed air.
(*c*) lift water from a well by using compressed air.
(*d*) lift air under negative pressure.

341. A pressure head of 320 metres of water in meters of CCl_4 (sp.gr = 1.6) will be
(*a*) 100 (*b*) 200
(*c*) 320 (*d*) 160

342. In which of the following body shapes, the pressure drag is large compared to the friction drag ?
(*a*) Stream line body
(*b*) Two dimensional body
(*c*) Bluff body
(*d*) None of these

343. The ratio of the depth of flow to the hydraulic radius for the most economical trapezoidal section, in open channel flow is
(*a*) 0.5 (*b*) 1
(*c*) 1.5 (*d*) 2

344. Mach number is important in a fluid flow problem, when the inertia and ..... forces predominate.
(*a*) elastic (*b*) viscous
(*c*) gravity (*d*) none of these

345. The Mach number for hypersonic flow of compressible fluid is
(*a*) 1 (*b*) > 1
(*c*) > 4 (*d*) < 2

346. Air vessel of a reciprocating pump is initially filled with
(*a*) atmospheric air
(*b*) compressed air
(*c*) water (*d*) none of these

347. Hydraulic..... works on the principle of Pascal's law of transmission of fluid pressure.
(*a*) press (*b*) turbine
(*c*) pump (*d*) coupling

348. Ratio of pressure and inertia force gives ..... number.
(*a*) Weber (*b*) Mach
(*c*) Euler (*d*) Froude

349. The ratio of the depth of flow to the diameter of the channel for maximum discharge in a circular channel in open channel flow is
(*a*) 0.1 (*b*) 0.55
(*c*) 0.95 (*d*) 1.85

350. The co-efficient of drag and lift for an incompressible fluid depends on the
(*a*) Reynolds number
(*b*) Froude number
(*c*) Mach number (*d*) all (*a*), (*b*) and (*c*)

351. What is the ratio of displacement thickness to nominal thickness for a linear distribution of velocity in the boundary layer on a flat plate ?
(*a*) 0.5 (*b*) 1
(*c*) 1.5 (*d*) 2

352. What is the ratio of the velocity at the axis of the pipe to the mean velocity of flow in case of pipe flow under viscous condition ?

(*a*) 0.5 (*b*) 0.67
(*c*) 1 (*d*) 2

353. The frictional resistance in laminar flow does not depend on the
(*a*) area of surface in contact.
(*b*) flow velocity.
(*c*) fluid temperature.
(*d*) pressure of flow.

354. Capillary tube method of viscosity measurement is based on the
(*a*) Hagen–Poiseulle's equation
(*b*) Stoke's law
(*c*) Navier-stokes equation
(*d*) none of these

355. The contraction co-efficient for Borda's mouthpiece (for frictionless fluid) is
(*a*) 0.1 (*b*) 0.5
(*c*) 0.94 (*d*) 1

356. What is the pipe called which lifts water from a reservoir to a greater height than the initial level in the supply reservoir ?
(*a*) Penstock (*b*) Siphon
(*c*) Tunnel (*d*) Pressure pipeline

357. In case of a ....., the energy of flow is considerably decreased downstream of the machine.
(*a*) blower (*b*) turbine
(*c*) centrifugal pump
(*d*) centrifugal fan

358. Bernoulli's equation is not applicable, when the flow is
(*a*) irrotational. (*b*) incompressible.
(*c*) viscous. (*d*) all (*a*), (*b*) & (*c*).

359. What causes convective acceleration in fluid flow ?
(*a*) Steep slope in flow
(*b*) Unsteady nature of flow
(*c*) Non-uniformity of flow
(*d*) Turbulence in flow

360. In which type of fluid flow, the velocity of flow of fluid changes from point to point in the fluid at any instant ?
(*a*) Rotational (*b*) Unsteady
(*c*) Turbulent (*d*) Non-uniform

361. Paper pulp is an example of ..... fluid.
(*a*) dilatant (*b*) bingham plastic
(*c*) Newtonion (*d*) pseudoplastic

362. A gas
(*a*) signifies absence of density.
(*b*) can resist shearing action.
(*c*) is incompressible.
(*d*) is a supercritical vapor.

363. The time of oscillation of a floating body is
(*a*) longer, if metacentric height is increased.
(*b*) independent of the metacentric height.
(*c*) dependent on the buoyant forces only.
(*d*) none of these.

364. The flow of a liquid through tapering pipe at a constant rate is an example of ..... flow.
(*a*) steady uniform
(*b*) steady non uniform
(*c*) unsteady uniform
(*d*) unsteady non uniform

365. What type of motion the fluid element undergoes, when it changes from one position to another position, such that the angle between the two sides change ?
(*a*) Rotation (*b*) Translation
(*c*) Linear deformation
(*d*) Angular deformation

366. Which of the following fluid forces are not considered in the Navier-Stoke's equation?
(*a*) Gravity forces (*b*) Viscous forces
(*c*) Pressure forces(*d*) Turbulent forces

367. Each term in Bernaulli's equation represents the..... of the fluid.
(*a*) energy per unit mass
(*b*) energy per unit weight
(*c*) force per unit mass
(*d*) none of these

368. The Prandtl pitot tube measures the
(*a*) velocity at a point in the flow.
(*b*) pressure at a point.
(*c*) average flow velocity.
(*d*) pressure difference in pipe flow.

369. The pump impeller and the turbine runner in a hydraulic torque converter
(*a*) have the same diameter.
(*b*) have different diameters.
(*c*) are directly coupled.
(*d*) none of these.

370. At what value of crank angle (roughly), no flow of water from or into the air vessel takes place in case of a double acting reciprocating pump ?

(*a*) 40° and 140° (*b*) 45° and 60°
(*c*) 90° and 80° (*d*) 20° and 120°

371. The percentage slip in a reciprocating pump set is given by the % of

(*a*) Q_1/Q_2 (*b*) Q_2/Q_1
(*c*) $\frac{Q_2 - Q_1}{Q_1}$ (*d*) $\frac{Q_2 - Q_1}{Q_2}$

where, Q_1 = actual discharge

Q_2 = theoretical discharge

372. Reciprocating pumps are not able to compete with the centrifugal pump for industrial use, mainly because these pumps have

(*a*) very low speeds.
(*b*) smaller discharge.
(*c*) higher capital & maintenance cost.
(*d*) high vibrations.

373. What is the ratio of total kinetic energy of fluid passing per second to the value obtained on the basis of average velocity (for laminar flow through a circular pipe)?

(*a*) 0.5 (*b*) 1
(*c*) 1.5 (*d*) 2

374. Prandtl number is a measure of the

(*a*) heat conduction to viscosity of a fluid.
(*b*) C_p/C_v of a fluid.
(*c*) elastic force to pressure force in the fluid flow.
(*d*) inertial force to elastic force in the fluid flow.

375. The ratio of the hydraulic radius to the diameter of the channel, for maximum mean velocity of flow in a circular channel, in open channel flow is

(*a*) 0.3 (*b*) 0.9
(*c*) 0.03 (*d*) 0.66

376. The boundary layer thickness at a given section along a flat plate ..... with increasing Reynold's number.

(*a*) increases (*b*) decreases
(*c*) remains same
(*d*) may increase or decrease

377. The energy loss in flow through venturimeter is less than that through flow nozzle, because in case of a flow nozzle, the

(*a*) length is shorter.
(*b*) throat diameter is more.
(*c*) sudden expansion of flow in the downstream occurs.
(*d*) distance between the throat and the inlet is more.

378. In case of end to end connection of two or more pipes in series, the ..... each pipe.

(*a*) same rate of flow passes through
(*b*) head loss is same through
(*c*) rate of flow in each pipe is proportional to the length of
(*d*) total flow rate is the sum of flow rate in

379. A venturimeter can not be used for the direct measurement of

(*a*) datum difference in the stretch of pipe flow.
(*b*) pressure difference in the flow through pipeline.
(*c*) friction loss in pipe flow.
(*d*) all (*a*), (*b*) and (*c*).

380. Drag is the force component exerted on an immersed object,

(*a*) passing the centroid of the body at 60° to the direction of motion.
(*b*) the component being parallel to the flow direction.
(*c*) the component being normal to the flow direction.
(*d*) none of these.

381. Normal depth in open channel flow is the depth of flow in the channel

(*a*) corresponding to uniform flow.
(*b*) measured normal to the channel bed.
(*c*) corresponding to steady flow.
(*d*) none of these.

382. The velocity for subsonic flow in a pipeline

(*a*) increases in the downstream direction.
(*b*) is constant.
(*c*) decreases in the downstream direction.
(*d*) is independent of the area of flow.

383. In a free vortex, the

(*a*) velocity changes linearly with radial distance.
(*b*) flow is necessarily rotational.
(*c*) radial component of velocity is same everywhere.
(*d*) stream lines are not circular.

384. Which of the fluid forces are not considered in the Reynold's equation of flow ?
(*a*) Viscous forces (*b*) Turbulent forces
(*c*) Pressure forces
(*d*) Compressibility forces

385. The component of acceleration resulting due to unsteady nature of flow is called....acceleration.
(*a*) normal (*b*) local
(*c*) convective (*d*) tangential

386. In isotropic turbulence, the ..... are equal to each other.
(*a*) temporal velocity components
(*b*) mean square of velocity fluctuations in the three co-ordinate directions
(*c*) root mean square of velocity fluctuations in the three co-ordinate directions
(*d*) none of these

387. For a reciprocating pump, the indicator diagram is the graph between the
(*a*) discharge and overall efficiency.
(*b*) volume swept by piston for one complete revolution and the pressure in the cylinder.
(*c*) angle swept by the crank pin at any instant and the discharge.
(*d*) none of these.

388. Air vessel fitted to a reciprocating pump
(*a*) increases the work done.
(*b*) decreases the work done.
(*c*) causes cavitation.
(*d*) results in non-uniform discharge.

389. The capacity of an accumulator is the maximum
(*a*) energy which it can store.
(*b*) discharge which it can deliver.
(*c*) liquid which it can store.
(*d*) none of these.

390. Hydraulic intensifier is used for increasing the
(*a*) rate of velocity of liquid supply.
(*b*) rate of flow through delivery pipeline of a pump.
(*c*) intensity of pressure of the liquid.
(*d*) momentum rate through delivery pipe.

391. The peripherial velocity at inlet of a centrifugal pump having inlet diameter of 25 cms and rotating at 950 rpm is.....m/sec.
(*a*) 1.8 (*b*) 12.4
(*c*) 186.2 (*d*) 736.4

392. In open channel flow in a rectangular channel, the ratio between the critical depth and the initial depth, when a hydraulic jump occurs is
(*a*) 0.5 (*b*) 0.84
(*c*) 1.84 (*d*) 1.25

393. Which of the following conditions must be satisfied for lift force to be developed ?
(*a*) The body should be bluff body.
(*b*) The body should be stream lined.
(*c*) Circulation around the body is essentially required.
(*d*) The main stream velocity must approach the velocity of sound in that fluid medium.

394. Water hammer in a pipeline results from the
(*a*) bursting of pipelines due to closure by a valve.
(*b*) rapid pressure change due to a rapid change in the rate of flow.
(*c*) pressure increase due to closure of a valve resulting in decrease in rate of flow.
(*d*) none of these.

395. The energy loss over a length of pipeline according to Darcy-Weisbach equation for pipe flow is.....the mean velocity of flow.
(*a*) directly proportional to
(*b*) directly proportional to square of
(*c*) inversely proportional to
(*d*) inversely proportional to square of

396. The line traced by a single fluid particle as it moves over a period of time is called ..... line.
(*a*) stream (*b*) path
(*c*) equipotential (*d*) none of these

397. The line of action of the buoyant force passes through the centre of gravity of the
(*a*) submerged body.
(*b*) displaced volume of the fluid.
(*c*) volume of fluid vertically above the body.
(*d*) horizontal projection of the body.

398. A hydraulic press has a ram of 10 cms in diameter and a plunger of 1 cm in diameter. The force required on the plunger to raise a weight of 10 tons on the ram is.....kg.
(*a*) 10 (*b*) 100
(*c*) 1000 (*d*) 10000

399. Buoyant force
(*a*) for non-symmetrical bodies is not vertical.
(*b*) depends on the depth of the submergence of the floating body.
(*c*) depends on the weight of the floating body.
(*d*) none of these.

400. The lift of a ballon is
(*a*) increased, as it rises to a higher altitude.
(*b*) due to the weight of the atmospheric air, that it displaces.
(*c*) not dependent on the temperature of the atmosphere.
(*d*) none of these.

401. Centre of pressure in an immersed body is..... the centre of gravity.
(*a*) above (*b*) below
(*c*) at
(*d*) either above or below; depends on the liquid density

402. Water flow rate in a pipe of 3.5 metres diameter can be most economically and conveniently measured by a/an
(*a*) pitot tube (*b*) venturimeter
(*c*) orificemeter (*d*) rotameter

403. Steady uniform flow is represented by flow through a/an
(*a*) long pipe at constant rate.
(*b*) long pipe at decreasing rate.
(*c*) expanding tube at constant rate.
(*d*) none of these.

404. Unsteady uniform flow is represented by flow through a/an
(*a*) long pipe at constant rate.
(*b*) long pipe at decreasing rate.
(*c*) expanding tube at increasing rate.
(*d*) expanding tube at constant rate.

405. Unsteady non-uniform flow is represented by flow through a/an
(*a*) long pipe at constant rate.
(*b*) long pipe at decreasing rate.
(*c*) expanding tube at increasing rate.
(*d*) expanding tube at constant rate.

406. Low specific speed of a pump implies that, it is a/an.....pump.
(*a*) axial flow (*b*) centrifugal
(*c*) mixed flow (*d*) none of these

407. Steady non-uniform flow is exemplified by flow through a/an
(*a*) long pipe at constant rate.
(*b*) long pipe at decreasing rate.
(*c*) expanding tube at increasing rate.
(*d*) expanding tube at constant rate.

408. High specific speed of a pump implies that, it is a/an.....pump.
(*a*) centrifugal (*b*) mixed flow
(*c*) axial flow (*d*) none of these

409. For pipe flows, head is proportional to ..... at constant capacity.
(*a*) $1/D$ (*b*) $1/D^2$
(*c*) $1/D^5$ (*d*) D^2
where, D = pipe diameter

410. Higher specific speed (200-500) of a centrifugal pump indicates that the pump is of.....flow type.
(*a*) axial (*b*) radial
(*c*) mixed (*d*) none of these

411. Power requirement of fans having constant wheel diameter varies..... fan speed.
(*a*) as square of (*b*) directly as
(*c*) as cube of (*d*) none of these

412. The pressure and power requirement of a gas fan at constant speed & capacity varies ..... the gas density.
(*a*) directly as
(*b*) inversely as square root of
(*c*) inversely as
(*d*) as square of

413. Air vessel provided in a reciprocating pump
(*a*) smoothens the flow by avoiding pulsations.
(*b*) increases the volumetric efficiency of the pump.
(*c*) saves the pump from the danger of cavitation.

(*d*) none of these.

414. Drag co-efficient for motion of spherical particles in a stationary fluid in the stoke's law range is

(*a*) $\frac{24}{N_{Re,p}}$ (*b*) $\frac{16}{N_{Re,p}}$

(*c*) $\frac{64}{N_{Re,p}}$ (*d*) $\frac{48}{N_{\mathrm{Re},\,p}}$

415. The unit of bulk modulus of elasticity for a liquid in S.I. unit is

(*a*) N (*b*) N/m

(*c*) N/m^2 (*d*) N/m^3

416. The simple pitot tube measures the ..... pressure.

(*a*) static (*b*) dynamic

(*c*) total (*d*) none of these

417. In Newton's law range, the drag co-efficient for the motion of spherical particle in a stationary fluid is

(*a*) 0.44 (*b*) 0.044

(*c*) 4.4 (*d*) 44

418. Which is not a variable head meter ?

(*a*) Venturimeter (*b*) Pitot tube

(*c*) Rotameter (*d*) None of these

419. Stoke's law is valid, when $N_{Re,p}$ is less than

(*a*) 2 (*b*) 100

(*c*) 2100 (*d*) 700

420. The ratio of wall drag to total drag in the Stoke's law range is

(*a*) 0.5 (*b*) 1

(*c*) 1/3 (*d*) 2/3

421. In Newton's law range, the terminal velocity of a solid spherical particle falling through a stationary fluid mass varies as the.....of its diameter.

(*a*) inverse (*b*) square root

(*c*) second power (*d*) first power

422. The ratio of the wall drag to the form drag in the Stoke's law range (for motion of spherical particles in a stationary fluid) is

(*a*) 0.5 (*b*) 1

(*c*) 2 (*d*) 0.33

423. One poise (unit of absolute/dynamic viscosity) is equivalent to one

(*a*) gm/cm^2. sec.

(*b*) gm/cm. sec.

(*c*) $cm^2/sec.$ (*d*) $m^2/sec.$

424. For motion of spherical particles in a stationary fluid, the drag co-efficient in hindered settling compared to that in free settling is

(*a*) more (*b*) less

(*c*) equal

(*d*) more or less, depending on the type of particle

425. In the Newton's law range, the terminal velocity of a solid spherical particle falling through a stationary fluid mass is ..... the fluid viscosity.

(*a*) directly proportional to

(*b*) inversely proportional to

(*c*) inversely proportional to the square root of

(*d*) independent of

426. The head loss in turbulent flow in pipe is proportional to

(*a*) V^2 (*b*) $1/V^2$

(*c*) $1/V$ (*d*) V

where, V = velocity of fluid through the pipe

427. Velocity head on sudden enlargement in a horizontal pipe is converted into .....head.

(*a*) elevation (*b*) pressure

(*c*) both (*a*) & (*b*) (*d*) neither (*a*) nor (*b*)

428. Transition length for turbulent flow in smooth pipe is equal to ..... times the pipe diameter.

(*a*) 0.5 (*b*) 5

(*c*) 50 (*d*) 100

429. Laminar flow is characterised by the non-existence of

(*a*) pressure fluctuation.

(*b*) eddies.

(*c*) deviating velocities.

(*d*) all (*a*), (*b*) & (*c*).

430. Boundary layer exists in flow

(*a*) of real fluids.

(*b*) over flat surfaces only.

(*c*) in pipes only.

(*d*) of ideal fluids only.

431. Upto what value of 'Mach number', a fluid may be considered as incompressible ?

(*a*) 0.03 (*b*) 0.3

(*c*) 3 (*d*) 10

432. The ..... is measured by a piezometric opening.
(*a*) dynamic pressure
(*b*) static pressure
(*c*) total pressure (*d*) point velocity

433. With the increase in depth, the hydrostatic pressure in an unaccelerated incompressible fluid (in a constant gravitational field)
(*a*) decreases. (*b*) increases linearly.
(*c*) increases exponentially.
(*d*) remains constant.

434. One stoke (unit of kinematic viscosity) is equivalent to
(*a*) 1 cm^2/second (*b*) 1 m^2/second
(*c*) 1 gm/cm. second
(*d*) 1 kg . m/second

435. In an incompressible flow of fluid, the fluid
(*a*) temperature remains constant.
(*b*) compressibility is greater than zero.
(*c*) density does not change with pressure & temperature.
(*d*) is frictionless.

436. With increase in temperature, the vapor pressure of liquids
(*a*) increases (*b*) increases linearly
(*c*) decreases
(*d*) remains constant

437. The continuity equation of fluid mechanics utilises the principle of conservation of
(*a*) momentum (*b*) mass
(*c*) energy (*d*) both (*b*) & (*c*)

438. The ratio of pressure forces to inertial forces is called the ..... number.
(*a*) Froude (*b*) Euler
(*c*) Reynold (*d*) Mach

439. The ratio of inertial forces to viscous forces is called the.....number.
(*a*) Weber (*b*) Mach
(*c*) Froude (*d*) Reynold

440. Which of the following is dimensionless ?
(*a*) Angular velocity
(*b*) Fanning friction factor
(*c*) Specific volume
(*d*) None of these

441. Unit of mass velocity is
(*a*) kg/hr (*b*) kg/m^2. hr
(*c*) kg/m^2 (*d*) kg/m^3. hr

442. The pressure head on sudden contraction in a horizontal pipe is converted into the.....head.
(*a*) elevation (*b*) velocity
(*c*) both (*a*) & (*b*)
(*d*) neither (*a*) nor (*b*)

443. For turbulent flow of newtonion fluid in a circular cross-section pipe, the ratio of maximum to average fluid velocity is
(*a*) 0.5 (*b*) 1
(*c*) 0.66 (*d*) < 0.5

444. Friction produced by the formation of wakes is called the ..... friction.
(*a*) disk (*b*) skin
(*c*) form (*d*) none of these

445. Which of the following flow measuring devices is an area meter ?
(*a*) Venturimeter (*b*) Orifice meter
(*c*) Anemometer (*d*) Rotameter

446. Schedule number of a pipe, which is a measure of its wall thickness, is given by
(*a*) $1000\ P'/S$ (*b*) $100\ P'/S$
(*c*) $1000\ S/P'$ (*d*) $10000\ P'/S$

447. What causes cavitation in centrifugal pump ?
(*a*) High suction pressure
(*b*) Low barometric pressure
(*c*) Low suction pressure
(*d*) High suction velocity

448. Which of the following has the maximum compression ratio ?
(*a*) Blower (*b*) Compressor
(*c*) Vacuum pump (*d*) Fan

449. Foot valve provided in the pump is a ..... valve.
(*a*) direction control
(*b*) back pressure
(*c*) relief (*d*) pressure reduction

450. Absolute viscosity of a fluid is a function of the .... of the fluid.
(*a*) motion
(*b*) pressure & temperature
(*c*) shearing stress
(*d*) both (*b*) & (*c*)

451. Non-colloidal solution is an example of the ..... fluid.
(*a*) non-Newtonion (*b*) Newtonion
(*c*) dilatent (*d*) pseudoplastic

452. Sewage sludge is an example of the ..... fluid.
(*a*) Bingham plastic
(*b*) Newtonion
(*c*) pseudoplastic (*d*) dilatent

453. A perfect gas
(*a*) does not satisfy $PV = nRT$.
(*b*) is incompressible and has zero viscosity.
(*c*) has constant specific heat.
(*d*) can't develop shear stresses.

454. In area meter (*e.g.*, rotameter), with increase in the fluid flow rate, the
(*a*) pressure drop increases linearly.
(*b*) pressure drop is almost constant.
(*c*) area through which fluid flows does not vary.
(*d*) none of these.

455. In case of supersonic flow of a fluid through pipeline, the 'Mach number' is
(*a*) 0 (*b*) 1
(*c*) < 1 (*d*) > 1

456. ..... forces act on a particle moving through a stationary fluid.
(*a*) Gravity (*b*) Drag
(*c*) Buoyant (*d*) all (*a*), (*b*), & (*c*)

457. Existence of boundary layer in fluid flow is because of the
(*a*) surface tension (*b*) fluid density
(*c*) fluid viscosity (*d*) gravity forces

458. Manometers measure the.....pressure.
(*a*) vacuum as well as the atmospheric
(*b*) difference in
(*c*) absolute (*d*) gage

459. The capillary rise of mercury is maximum in glass tube of dia ..... mm.
(*a*) 0.5 (*b*) 1
(*c*) 2 (*d*) 5

460. A venturimeter measures the
(*a*) velocity head (*b*) pressure
(*c*) point velocity (*d*) none of these

461. Experimental study of laminar fluid flow through a circular tube was conducted by
(*a*) Reynolds (*b*) Hagen and Poiseuille
(*c*) Pascal (*d*) Blake-Plummer

462. If Blausius or Darcey friction factor is 'f_1', then the Fanning friction factor is equal to
(*a*) $f_1/4$ (*b*) $4f_2$
(*c*) $2f_1$ (*d*) $f_1/2$

463. Permanent loss in a venturimeter is about ..... percent of the pressure drop in the upstream cone.
(*a*) 1 (*b*) 10
(*c*) 40 (*d*) 70

464. ..... is an example of axial flow impeller.
(*a*) Paddle (*b*) Turbine
(*c*) Propeller (*d*) all (*a*), (*b*) and (*c*)

465. One horsepower is equal to
(*a*) 550 lb_f.ft/second
(*b*) 550 kg_f.m/second
(*c*) both (*a*) and (*b*)
(*d*) 550 lb_f.ft./hr

466. Slurries can be most conveniently pumped by a.....pump.
(*a*) screw (*b*) reciprocating
(*c*) gear (*d*) centrifugal

467. A fluid which has a linear relationship between the magnitude of applied shear-stress and the resulting rate of deformation is called a/an.....fluid.
(*a*) Newtonion (*b*) Non-Newtonion
(*c*) ideal (*d*) incompressible

468. As per Newton's law of viscosity, the shear stress for a given rate of angular deformation of fluid is proportional to
(*a*) $1/\mu$ (*b*) μ
(*c*) μ^2 (*d*) $1/\mu^2$
where, μ = fluid viscosity

469. N. second/m^2 is
(*a*) the S.I. unit of dynamic viscosity.
(*b*) the S.I. unit of kinematic viscosity.
(*c*) equivalent to one poise.
(*d*) equivalent to one stoke.

470. Which of the following properties of a fluid is responsible for offering resistance to shear ?
(*a*) Surface tension.
(*b*) Viscosity.
(*c*) Specific gravity.
(*d*) All (*a*), (*b*), and (*c*).

471. Rubber latex is an example of.....fluid.
(*a*) dilatent (*b*) Newtonion
(*c*) pseudoplastic (*d*) Bingham plastic

472. Very small pressure difference (< 5 mm water coloumn) can be most conveniently measured by a/an.....manometer.
(*a*) U-tube water. (*b*) U-tube mercury.
(*c*) inclined tube mercury.
(*d*) inclined tube water.

473. Kinetic energy of fluid per unit weight represented by the velocity head is given by
(*a*) $2v^2/g_c$ (*b*) $v^2/2g_c$
(*c*) $\rho v^2/g_c$ (*d*) $\rho \, . \, v^2/2g_c$

474. The equivalent diameter for pressure drop calculation for a duct of square cross-section is given by
(*a*) x (*b*) $\sqrt{\pi.x}$
(*c*) $\sqrt{2x}$ (*d*) $\sqrt{x/2}$
where, x = each side of the square duct

475. Vane anemometer
(*a*) is an area meter.
(*b*) is a variable head meter.
(*c*) rotates an element at a speed determined by the velocity of the fluid in which the meter is immersed.
(*d*) none of these.

476. Pitot tube measures the ..... of a fluid.
(*a*) pressure (*b*) average velocity
(*c*) average flow rate
(*d*) point velocity

477. Venturimeter and orificemeter measures the ..... of the fluid.
(*a*) pressure (*b*) maximum velocity
(*c*) average velocity
(*d*) point velocity

478. Pick out the correct statement.
(*a*) A forced vortex occurs when fluid rotates as a solid about an axis.
(*b*) In laminar flow, Newton's law of viscosity does not apply.
(*c*) A free vortex occurs, when fluid rotates as a solid.
(*d*) In turbulent flow, there are neither cross-currents nor eddies.

479. Quicksand is an example of a.....fluid.
(*a*) bingham plastic
(*b*) dilatent
(*c*) Newtonion (*d*) pseudoplastic

480. Bernoulli's equation for fluid flow is derived following certain assumptions. Out of the assumptions listed below, which set of assumptions is used in derivation of Bernoulli's equation ?
A. Fluid flow is frictionless & irrotational.
B. Fluid flow is steady.
C. Fluid flow is uniform & turbulent.
D. Fluid is compressible.
E. Fluid is incompressible.
(*a*) A, C, D (*b*) B, D, E
(*c*) A, B, E (*d*) A, D, E

481. Ratio of inertial forces to surface tension forces is called the ..... number.
(*a*) Euler (*b*) Froude
(*c*) Mach (*d*) Weber

482. Which of the following is not a dimensionless parameter ?
(*a*) Euler number (*b*) Specific gravity
(*c*) Fanning friction factor
(*d*) None of these

483. The boundary layer is that part of a moving fluid, in which the fluid velocity is
(*a*) affected by the fluid flow pressure.
(*b*) constant.
(*c*) affected by the presence of a solid boundary.
(*d*) all (*a*), (*b*) and (*c*).

484. Which of the following relationship is valid for the equilibrium position of the float in a rotameter ?
(*a*) $D_f + B_f = W_f$ (*b*) $D_f = B_f + W_f$
(*c*) $D_f + B_f + W_f = 0$ (*d*) none of these
where, D_f = Drag force on the float
B_f = Buoyant force on the float
W_f = Weight of the float

485. The capacity of a centrifugal pump can be increased by increasing the
(*a*) impeller diameter or speed.
(*b*) number of pumps and joining them in series.
(*c*) number of pumps and joining them in parallel.
(*d*) all (*a*), (*b*) and (*c*).

486. Centrifugal pumps as compared to reciprocating pumps
(*a*) run at a lower speed for the same discharge.
(*b*) do not need priming.
(*c*) deliver fluid with pulsating/fluctuating discharge.
(*d*) can be run with discharge line valve closed for a short interval.

487. Propeller type centrifugal pumps are most suitable for
(*a*) high capacity at high heads.
(*b*) high capacity at low heads.
(*c*) low capacity at high heads.
(*d*) low capacity at low heads.

488. In case of isentropic flow, the speed of sound in an ideal gas is proportional to
(*a*) $1/\sqrt{M}$ (*b*) $\sqrt{M}$
(*c*) $1/M$ (*d*) M
where M = molecular weight of the gas

489. In case of isentropic flow, the speed of sound in an ideal gas is proportional to
(*a*) $1/\sqrt{T}$ (*b*) $1/T$
(*c*) $\sqrt{T}$ (*d*) T
where, T = absolute temperature

490. In fluid flow, the boundary layer separation can not occur
(*a*) in case of boundaries experiencing form drag.
(*b*) at points of abrupt changes in the flow directions.
(*c*) in laminar flow.
(*d*) none of these.

491. The fluid velocity varies as the square of the cylindrical pipe diameter, in case of steady state laminar flow at constant pressure drop, for.....fluid.
(*a*) Newtonion (*b*) dilatant
(*c*) pseudoplastic (*d*) non-Newtonion

492. Pick out the wrong statement pertaining to fluid flow.
(*a*) The ratio of average velocity to the maximum velocity for turbulent flow of Newtonion fluid in circular pipes is 0.5.
(*b*) The Newtonion fluid velocity in a circular pipe flow is maximum at the centre of the pipe.
(*c*) Navier-Stokes equation is applicable to the analysis of viscous flows.
(*d*) Hagen-Poiseuille equation is applicable to the laminar flow of Newtonion fluids.

493. For laminar flow of Newtonion fluid in a circular pipe, the velocity distribution is a function of the distance '*d*' measured from the centre line of the pipe, and it follows a ..... relationship.
(*a*) logarithmic (*b*) parabolic
(*c*) hyperbolic (*d*) linear

494. Mass velocity in case of steady flow and through a constant cross-section conduit is independent of the
(*a*) temperature (*b*) pressure
(*c*) both (*a*) & (*b*) (*d*) neither (*a*) nor (*b*)

495. The terminal velocity of a solid spherical particle falling through a stationary fluid mass in the Stoke's law range is proportional to the
(*a*) inverse of fluid viscosity.
(*b*) square of particle size.
(*c*) difference in the densities of the particle & fluid.
(*d*) all (*a*), (*b*) and (*c*).

496. The fluid velocity varies as the square root of the cylindrical pipe diameter in case of steady state laminar flow at constant pressure drop for.....fluid.
(*a*) dilatant (*b*) pseudoplastic
(*c*) Bingham plastic
(*d*) Newtonion

497. For laminar flow of Newtonion fluids through a circular pipe, for a given pressure drop and length & diameter of pipe, the velocity of fluid is proportional to
(*a*) μ (*b*) $1/\mu$
(*c*) $\sqrt{\mu}$ (*d*) $1/\sqrt{\mu}$
where, μ = fluid viscosity

498. The ratio of inertial forces to gravity forces is called the.....number.
(*a*) Mach (*b*) Froude
(*c*) Euler (*d*) Weber

499. Flow measurement in an open channel is done by a/an
(*a*) venturimeter (*b*) orificemeter
(*c*) weir (*d*) rotameter

500. Speed of sound in an ideal gas depends on its
(*a*) temperature (*b*) pressure
(*c*) specific volume (*d*) none of these

501. Which of the following equations is valid for laminar flow of a fluid through packed bed?
(*a*) Fanning equation
(*b*) Kozney – Karman equation
(*c*) Hagen-Poiseuille equation
(*d*) Blake-Plummer equation

502. Fanning equation is given by
$\frac{\Delta p}{\rho} = 4f.\frac{L}{D}\cdot\frac{v^2}{2g_c}$. It is applicable to ..... region flow.

(*a*) transition (*b*) laminar
(*c*) turbulent (*d*) both (*b*) and (*c*)

503. Pick out the wrong statement.
(*a*) In a static mass of liquid, the pressure at a point is the same for all liquids.
(*b*) Pressure decreases exponentially with elevation in an isothermal atmosphere.
(*c*) Atmospheric pressure = absolute pressure–gage pressure.
(*d*) As per Pascal's law, the pressure at a point in a static or uniformly moving fluid is equal in all directions.

504. The fluid velocity varies as the cube of the cylinderical pipe diameter in case of steady state laminar flow at constant pressure drop for.....fluid.
(*a*) Newtonion (*b*) pseudoplastic
(*c*) dilatent (*d*) Bingham plastic

505. Pick out the correct statement pertaining to transition/ entrance length in fluid flow.
(*a*) The length of entrance region of pipe, in which full development of fluid flow takes place such that velocity profile does not change downstream, is called the transition length.
(*b*) Transition length for laminar flow of Newtonion fluids in a pipe of diameter '*d*' is equal to 0.05. D.N_{Re}.
(*c*) Transition length for turbulent flow of Newtonion fluids in a smooth pipe of diameter '*d*' is equal to 50 D.
(*a*) all (*a*), (*b*) and (*c*).

506. The effect of solid boundary on the fluid flow is confined to the boundary layer, except for fluids
(*a*) having high viscosities.
(*b*) moving at low velocities.
(*c*) both (*a*) & (*b*).
(*d*) neither (*a*) nor (*b*).

507. The ratio of inertial forces to elastic forces is called the ..... number.
(*a*) Reynolds (*b*) Mach
(*c*) Euler (*d*) Weber

508. The net positive suction head (NPSH) of a centrifugal pump is defined as the sum of the velocity head and the pressure head at the
(*a*) discharge. (*b*) suction.
(*c*) suction minus vapor pressure of the liquid at suction temperature.
(*d*) discharge minus vapor pressure of the liquid at the discharge temperature.

509. For turbulent flow in smooth circular pipe, the velocity distribution is a function of the distance '*d*' measured from the wall of the pipe and the friction velocity '*v*', and it follows a ..... relationship.
(*a*) logarithmic (*b*) linear
(*c*) hyperbolic (*d*) parabolic

510. Prandtl mixing length is
(*a*) applicable to laminar flow problems.
(*b*) a universal constant.
(*c*) zero at the pipe wall.
(*d*) none of these.

511. All pipes of a particular nominal size have the same
(*a*) inside diameter (*b*) outside diameter
(*c*) thickness (*d*) none of these

512. Buckingham–π theorem states that in any physical problem including '*n*' quantities having '*m*' diamensions, the quantities can be arranged into.....independent dimensionless parameters.
(*a*) m (*b*) n
(*c*) $n - m$ (*d*) n/m

513. Consider a centrifugal pump having a specific impeller diameter, fixed impeller speed pumping a liquid of constant density at a particular discharge capacity. With decrease in the capacity of the pump, the .....decreases.
(*a*) NPSH required.
(*b*) BHP required by the pump.
(*c*) head of the liquid pumped.
(*d*) all (*a*), (*b*) and (*c*).

514. Out of the following flow measuring devices, which one incurs the maximum installation cost as well as pressure loss ?
(*a*) Flow nozzle (*b*) Venturimeter
(*c*) Rotameter (*d*) Orificemeter

515. Which is the most efficient and best for measuring very small flow rate of gases ?
(*a*) Venturimeter (*b*) Orifice meter
(*c*) Rotameter (*d*) Flow nozzle

516. Boundary layer thickness in turbulent flow over a flat plate increases as
(*a*) $\sqrt{d}$ (*b*) $d^{2/3}$

(*c*) $d^{4/5}$ (*d*) $d^{1/3}$

where, d = distance from the leading edge.

517. For turbulent flow of fluids in rough pipe, fanning friction factor does not depend upon

(*a*) V & μ (*b*) ε

(*c*) D & ρ (*d*) L

where, V, ρ and μ are fluid's velocity, density & viscosity respectively.

ε = roughness projection size ; L and D are length & diameter of the pipe respectively.

518. Which of the following equations applies to the fluid flow through a packed bed for very large Reynolds number ?

(*a*) Fanning equation
(*b*) Blake-Plummer equation
(*c*) Hagen-Poiseulle equation
(*d*) Kozney-Karman equation

519. In magnetic flow meters, voltage generation is

(*a*) due to the motion of conducting fluid through an externally generated uniform field.
(*b*) proportional to the fluid velocity.
(*c*) both (*a*) and (*b*).
(*d*) neither (*a*) nor (*b*).

520. The ratio of average fluid velocity to the maximum velocity in case of laminar flow of a Newtonion fluid in a circular pipe is

(*a*) 0.5 (*b*) 1
(*c*) 2 (*d*) 0.66

521. Rise of liquid in a capillary tube is due to

(*a*) cohesion (*b*) adhesion
(*c*) both (*a*) & (*b*) (*d*) neither (*a*) nor (*b*)

522. Fluid resistance to shear depends upon its

(*a*) rate of transfer of molecular momentum.
(*b*) cohesion. (*c*) both (*a*) and (*b*).
(*d*) neither (*a*) nor (*b*).

523. Select the wrong statement pertaining to flow of an incompressible fluid through a venturimeter.

(*a*) For frictionless flow, the fluid pressure entering the venturi meter will be exactly equal to that leaving the venturimeter.
(*b*) Discharge of fluid through a venturimeter depends upon the gage difference irrespective of the orientation of venturimeter.
(*c*) Venturimeter occupies less space than an orificemeter.
(*d*) Venturimeter incurs less power loss compared to an equivalent orificemeter.

524. Hot wire anemometer is used to measure the

(*a*) velocity of liquids.
(*b*) temperature of liquids.
(*c*) velocity of gases.
(*d*) pressure of liquids.

525. With increase in the ratio of orifice diameter to pipe diameter in case of an orificemeter, the overall pressure loss

(*a*) decreases (*b*) increases
(*c*) remains constant
(*d*) increases linearly

526. In fluid flow, cavitation is caused, if the

(*a*) fluid velocity decreases to zero.
(*b*) total energy decreases.
(*c*) both (*a*) and (*b*).
(*d*) flow pressure approaches its vapor pressure at the prevailing temperature.

527. In centrifugal pump operation, the cavitation can be eliminated by maintaining suction pressure .... the vapor pressure of the liquid at the suction temperature.

(*a*) lower than (*b*) higher than
(*c*) equal to (*d*) none of these

528. Mercury is an ideal barometric fluid mainly due to its

(*a*) high density. (*b*) low compressibility.
(*c*) low capillary action.
(*d*) very low vapor pressure.

529. Fluid flow through a packed bed is represented by the.....equation.

(*a*) Fanning's (*b*) Ergun's
(*c*) Hagen-Poiseuille's
(*d*) none of these

530. A pipe is defined as 'hydraulically smooth', if the friction factor

(*a*) is not a function of Reynolds number.
(*b*) for a given Reynolds number remains constant even on further smoothening of the pipe.
(*c*) is zero irrespective of the Reynolds number.
(*d*) none of these.

531. Fanning friction factor for laminar flow of fluid in a circular pipe is

(*a*) not a function of the roughness of pipe wall.
(*b*) inversely proportional to Reynolds number.
(*c*) both (*a*) & (*b*).
(*d*) neither (*a*) nor (*b*).

532. Drag force on the float of a rotameter is
(*a*) αQ (*b*) $\alpha \sqrt{Q}$
(*c*) αQ^2 (*d*) constant
where, Q = flow rate of the fluid

533. Boundary layer thickness in laminar flow over a flat plate increases as
(*a*) $\sqrt{d}$ (*b*) $d^{1/3}$
(*c*) d^2 (*d*) $d^{2/3}$
where, d = distance from the leading edge.

534. Dimension of surface tension is
(*a*) FL^{-1} (*b*) $F^{-1}.L$
(*c*) $F.L^{-2}$ (*d*) $F^{-2}.L$
where, F = force, L = length

535. Capillary rise of mercury in a small diameter tube is proportional to
(*a*) d (*b*) $1/d$
(*c*) σ (*d*) $1/\sigma$
where, d = diameter of the tube,
σ = surface tension of mercury

536. Pick out the wrong statement.
(*a*) The eddy viscosity is a function of the type of turbulence involved.
(*b*) The eddy viscosity is a fluid property.
(*c*) The viscosity of gas increases with increase in temperature.
(*d*) The viscosity of a liquid increases with decrease in temperature.

537. Pressure drop for laminar fluid flow through a circular pipe is given by
(*a*) $4f \cdot \frac{L}{D} \cdot \frac{V^2}{2g_c} \cdot \rho$ (*b*) $32 \frac{\mu LV}{g_c . D^2}$
(*c*) $16/N_{Re}$ (*d*) $\frac{f.L.\rho}{D} \cdot \frac{V^2}{2g_c}$

538. Pressure drop for turbulent fluid flow through a circular pipe is given by
(*a*) $64/\text{Re}$ (*b*) $\frac{32\,\mu LV}{g_c . D^2}$
(*c*) $4f . \frac{L}{D} \cdot \frac{V^2}{2g_c} \cdot \rho$ (*d*) $f \cdot \frac{L}{D} \cdot \rho \cdot \frac{V^2}{2g_c}$

539. Check valve provided in the discharge line of a centrifugal pump serves the purpose of controlling the
(*a*) back flow of fluid in the event of stoppage of pump.
(*b*) discharge pressure.
(*c*) flow of liquid during operation of the pump.
(*d*) all (*a*), (*b*) and (*c*).

540. For a given fluid flow rate, which of the following incurs maximum head loss ?
(*a*) Orifice meter (*b*) Venturimeter
(*c*) Flow nozzle
(*d*) All of them incur the same head loss

541. Pick out the wrong statement.
(*a*) Surface tension of a liquid is because of the difference in magnitude of adhesive & cohesive forces.
(*b*) A hydrometer used for the determination of specific gravities of liquids works on the principle of buoyant forces.
(*c*) In case of unsteady fluid flow, the velocity at any given point does not change with time.
(*d*) Turbulent fluid flow is characterised by the rapid fluctuation of instantaneous pressure & velocity at a point.

542. In case of a centrifugal pump, the theoretical head developed is dependent on the..... the impeller.
(*a*) speed of (*b*) diameter of
(*c*) fluid velocity leaving
(*d*) all (*a*), (*b*) and (*c*)

543. Each term of the Bernoulli's equation written in the form, $\frac{p}{\rho} + \frac{g}{g_c} . Z + \frac{v^2}{2g_c} =$ constant, represents the total energy per unit
(*a*) mass (*b*) volume
(*c*) specific weight (*d*) none of these

544. The pipe wall thickness is minimum for a pipe of given nominal size having schedule number
(*a*) 160 (*b*) 120
(*c*) 80 (*d*) 40

545. Pick out the correct statement.
(*a*) Fanning friction factor is inversely proportional to Reynolds number always.

(*b*) The property of a randomly packed bed (with raschig rings) is given by the ratio of the total volume to the volume of voids in the bed.

(*c*) Mach number in an incompressible fluid is always unity.

(*d*) Mach number is given by the ratio of the speed of the fluid to that of sound in the fluid under conditions of flow.

546. Pick out the wrong statement.

(*a*) The form drag is dependent upon the occurrence of a wake.

(*b*) The shear stress at any given cross-section of a pipe for steady flow (either laminar or turbulent) varies linearly as the radial distance.

(*c*) An ideal fluid is the one, which has negligible surface tension and obeys the Newton's law of viscosity.

(*d*) Existence of the boundary layer in fluid flow is because of viscosity of the fluid.

547. In fluid flow, the stagnation point is defined as a point, where the ..... is zero.

(*a*) flow velocity (*b*) pressure
(*c*) total energy (*d*) all (*a*), (*b*) and (*c*)

548. The .... pressure is measured by a static tube.

(*a*) dynamic (*b*) static
(*c*) total (*d*) none of these

549. Which of the following has the minimum compressibility ?

(*a*) Water at room temperature
(*b*) Air at room temperature
(*c*) Oxygen at room temperature
(*d*) Nitrogen at room temperature

550. The friction factor is

(*a*) always inversely proportional to the Reynolds number.

(*b*) not dimensionless.

(*c*) not dependent on the roughness of the pipe.

(*d*) none of these.

551. Velocity at a certain point in case of streamline flow is

(*a*) constant (*b*) independent of time
(*c*) both (*a*) & (*b*) (*d*) neither (*a*) nor (*b*)

552. Fanning friction factor is equal to

(*a*) $f_B/4$ (*b*) $f_B/2$
(*c*) $4f_B$ (*d*) $2f_B$

where, f_B = Blassius friction factor.

553. .....flow means the flow of incompressible fluid with no shear.

(*a*) Potential (*b*) Streamline
(*c*) Creep (*d*) Boundary layer

554. Brownian movement is prominent in the particle size range of .....microns in case of settling of a particle in a fluid.

(*a*) 2 to 3 (*b*) 0.01 to 0.10
(*c*) 200 to 300 (*d*) 100 to 1000

555. In case of turbulent flow of a Newtonion fluid in a straight pipe, the maximum velocity is equal to

(*a*) V_{avg} (*b*) $1.2\ V_{avg}$
(*c*) $1.5\ V_{avg}$ (*d*) $1.8\ V_{avg}$

where, V_{avg} = average fluid velocity

556. Where does the maximum stress occur in case of laminar flow of incompressible fluid in a closed conduit of diameter '*d*'?

(*a*) At the centre
(*b*) At *d*/4 from the wall
(*c*) At the wall
(*d*) At *d*/8 from the wall

557. In case of coutte flow, the fluid flow is between two large flat parallel plates with

(*a*) top plate moving and the bottom plate fixed.

(*b*) bottom plate moving and the top plate fixed.

(*c*) both the plates fixed.

(*d*) both the plates moving.

558. Sewage sludge is .....type of non-Newtonion fluid.

(*a*) dilatant (*b*) Bingham plastic
(*c*) Pseudo plastic (*d*) none of these

559. A fluid whose apparent viscosity increases with shear rate is termed as the ..... fluid.

(*a*) Newtonion (*b*) viscous
(*c*) dilatant (*d*) non-viscous

560. In case of venturimeters, friction losses are about ..... percent of maximum velocity head.

(*a*) 2 (*b*) 8
(*c*) 12 (*d*) 20

561. Open channel liquid flow is most conveniently measured by a

(*a*) hot wire anemometer

(*b*) notch
(*c*) rotameter (*d*) segmental orifice

562. The exit cone angle in case of a standard venturimeter is ..... the entrance cone angle.
(*a*) smaller than (*b*) greater than
(*c*) equal to (*d*) either (*a*) or (*b*)

563. In case of a rotameter, the density of the float material is .....that of the liquid it replaces.
(*a*) more than (*b*) less than
(*c*) equal to (*d*) either (*a*) or (*b*)

564. It is possible to integrate an automatic flow controller to a
(*a*) flow nozzle (*b*) venturimeter
(*c*) rotameter (*d*) none of these

565. The resistance wire used in a hot wire anemometer for conducting electrical current is made of
(*a*) copper (*b*) tungsten
(*c*) chromium (*d*) aluminium

566. .....pump is the most suitable device for discharging a liquid against a pressure of ≥ 1500 kgf/cm^2.
(*a*) Centrifugal (*b*) Piston
(*c*) Plunger (*d*) Vane

567. A special type of liquid transporting device is the diffuser pump, in which .....are minimised.
(*a*) bearing losses (*b*) disk friction
(*c*) shock losses (*d*) cavitation

568. Which of the following options will facilitate the achievement of a very high head (say 30 metres) in case of a centrifugal pump?
(*a*) Increasing the impeller speed and the volute area.
(*b*) Increasing the number of vanes in the impeller.
(*c*) Mounting of two or more impellers in series on a single shaft.
(*d*) Either of (*a*), (*b*) or (*c*).

569. A fluid is a substance, that
(*a*) has to be kept in a closed container.
(*b*) is almost incompressible.
(*c*) has zero shear stress.
(*d*) flows when even a small shear is applied to it.

570. A Newtonion fluid is that
(*a*) which follows Newton's law of motion.
(*b*) which needs a minimum shear, before it starts deforming.
(*c*) for which shear & deformation are related as $\tau = \mu \frac{\partial u}{\partial y}$.
(*d*) none of these.

571. An isentropic process is the one, in which
(*a*) pv = constant (*b*) pv^{γ} = constant
(*c*) pv^{γ} = constant, and process is reversible
(*d*) none of these

572. A streamline is a line in flow field,
(*a*) that is traced by all the fluid particles passing through a given point.
(*b*) along which a fluid particle travels.
(*c*) such that at every point on it, the velocity is tangential to it.
(*d*) none of these.

573. Euler's equation of motion is a statement expressing
(*a*) conservation of mass.
(*b*) conservation of energy.
(*c*) Newton's first law of motion.
(*d*) Newton's second law of motion.

574. If in a flow field, $\frac{p}{\rho} + \frac{g}{g_c} . z + \frac{v^2}{2g_c} = \text{constant}$ between any two points, then the flow must be
(*a*) steady, incompressible, irrotational.
(*b*) steady, compressible, irrotational.
(*c*) steady, compressible and along a streamline.
(*d*) unsteady, incompressible, irrotational.

575. Piezometric head is the sum of the .....heads.
(*a*) elevation & kinetic energy
(*b*) elevation & pressure
(*c*) kinetic energy & pressure
(*d*) none of these

576. Pascal's law is valid, only when the fluid is
(*a*) frictionless and at rest.
(*b*) at rest.
(*c*) at rest and when the frictionless fluid is in motion.
(*d*) none of these.

577. For a stable equilibrium of a submerged body
(a) G is above B (b) B is above G
(c) B & G coincide
(d) none of these
where, G and B are centres of gravity & buoyancy respectively.

578. For an unstable equilibrium of a floating body
(a) M is above G (b) M is below G
(c) M & G coincide(d) none of these
where, M = metacentre.

579. C_d, C_c and C_v are related (for flow through an orifice) as
(a) $C_d = C_c/C_v$ (b) $C_d = C_c \,.\, C_v$
(c) $C_d = C_v/C_c$ (d) none of these
where, C_d = discharge co-efficient

C_c = co–efficient of contraction

$$= \frac{\text{area of jet at vena–contracta}}{\text{area of opening}}$$

C_v = co–efficient of velocity

$$= \frac{\text{actual velocity at vena–contracta}}{\text{Theoretical velocity}}$$

580. C_d is always .....C_c.
(a) greater than (b) less than
(c) equal to
(d) either more or less than

581. For a given Reynold number as d/D for an orifice increases, C_d will
(a) increase (b) decrease
(c) remain constant
(d) either (a) or (b); depends on other factors
where, d & D are orifice & pipe diameters respectively.

582. C_d for the orifice plate varies from
(a) 0.58 to 0.8 (b) 0.93 to 0.98
(c) 0.2 to 0.3 (d) 0.02 to 0.03

583. If the head over the triangular notch is doubled, the discharge will increase by ..... times.
(a) 2 (b) 2.828
(c) 5.657 (d) 4

584. Major loss in sudden contraction in pipe flow is due to
(a) boundary friction.
(b) flow contraction.
(c) expansion of flow after sudden contraction.
(d) none of these.

585. If three pipes of different diameters, lengths & friction factors are connected in parallel, then
(a) $Q = Q_1 + Q_2 + Q_3$
(b) $V_1 = V_2 = V_3$
(c) $Q_1 = Q_2 = Q_3$
(d) $f = f_1 + f_2 + f_3$
where, Q = flow rate, V = fluid velocity
f = friction factor.

586. The maximum delivery pressure of compressors can be upto .....atmospheres.
(a) 10 (b) 100
(c) 250 (d) 1000

587. Medium viscosity lubricating oil can be most ideally pumped by a .....pump.
(a) vane (b) piston
(c) centrifugal (d) plunger

588. Rotary vacuum pumps can reduce the absolute pressure to as low as .....mm Hg.
(a) 1 (b) 0.1
(c) 0.01 (d) 0.001

589. Pick out the wrong statement :
(a) Greater is the kinematic viscosity of the liquid, greater is the thickness of the boundary layer.
(b) Blowers develop a maximum pressure of 2 atmospheres.
(c) Friction losses in pipe fittings are generally expressed in terms of velocity heads.
(d) Fanning friction factor in case of turbulent flow of liquids in pipe depends upon relative roughness & Reynolds number.

590. .....pumps are axial flow pumps.
(a) Turbine (b) Propeller
(c) Diffuser (d) none of these

591. Working of a .....pump characterises mixed flow.
(a) turbine (b) piston
(c) diaphragm (d) none of these

592. Draining of shallow pits or sump is done by a sump pump, which is a .....pump.
(a) single stage vertical
(b) centrifugal
(c) plunger (d) diffuser

593. When the head pumped against is less than the head of the fluid used for pumping, the usual device is a/an
(*a*) ejector (*b*) blower
(*c*) injector (*d*) air lift

594. When the momentum of one fluid is used for moving another fluid, such a device is called a/an
(*a*) jet pump (*b*) blower
(*c*) acid egg (*d*) none of these

595. The rate of shear versus the shear stress curves are time dependent for .....fluid.
(*a*) thixotropic (*b*) rheopectic
(*c*) both (*a*) & (*b*) (*d*) neither (*a*) nor (*b*)

596. For the same terminal conditions and valve size, the pressure drop in a fully opened globe valve as compared to that in a gate valve is
(*a*) more (*b*)less
(*c*) equal
(*d*) either (*a*) or (*b*); depends on the viscosity of the fluid

597. A compressor that takes suction at a pressure below atmospheric and discharge against atmospheric pressure is called a .....pump.
(*a*) sump (*b*) volute
(*c*) vacuum (*d*) submerged

598. Diaphragm valves are used for handling .....fluids.
(*a*) corrosive (*b*) viscous
(*c*) non-Newtonion(*d*) solid suspended

599. For the same terminal conditions and fitting size, the least friction loss is incurred in a/an
(*a*) T-joint (*b*) union
(*c*) 45° elbow (*d*) 90° bend

600. Two liquids manometer is used for measuring small pressure differences in
(*a*) liquids (*b*) gases
(*c*) mixture of hydrocarbons
(*d*) none of these

601. Small pressure differences in liquids is measured using a/an
(*a*) U-tube manometer.
(*b*) inclined tube manometer.
(*c*) pitot tube.
(*d*) none of these.

602. A differential pressure cell is used for
(*a*) measuring small pressure difference in gases.
(*b*) measuring small pressure difference in liquids.
(*c*) remote recording of pressure difference.
(*d*) measuring the difference of the impact & the static pressure.

603. Which of the following can be used for the direct measurement of volumetric flow rate of slurry ?
(*a*) Venturimeter (*b*) Orificemeter
(*c*) Rotameter (*d*) Pitot tube

604. In a/an ....., the flow rate of fluids is obtained by measuring the difference between the impact and the static pressure.
(*a*) rotameter (*b*) pitot tube
(*c*) venturimeter (*d*) flow nozzle

605. The ratio of hydrodynamic boundary layer to thermal boundary layer thickness in case of liquid metals is
(*a*) < 1 (*b*) 1
(*c*) > 1 (*d*) 2

606. The equivalent diameter for fluid flow through square cross section channel of side '*x*', for pressure drop calculation purpose is given by
(*a*) $4x$ (*b*) $2x$
(*c*) x (*d*) $\sqrt{x}$

607. When larger particles *e.g.*, grains are subjected to fluidisation, the corresponding bed produced is termed as the.....bed.
(*a*) spouted (*b*) sluggish
(*c*) boiling (*d*) teeter

608. With decrease in particle size to be fluidised by a particular fluid, the operating range of fluidisation velocity
(*a*) widens (*b*) squeezes
(*c*) does not change
(*d*) unpredictable from the data

609. Minimum fluidisation velocity for a specific system depends upon the
(*a*) particle size. (*b*) fluid viscosity.
(*c*) density of both the particle & the fluid.
(*d*) all (*a*), (*b*) and (*c*).

610. The ratio of maximum to average velocity in case of streamline flow between parallel plates is
(*a*) 1 (*b*) 1.5

(*c*) 2 (*d*) 2.5

611. Theoretical head developed by a centrifugal pump does not depend upon the .....the impeller.
(*a*) radius of (*b*) speed of
(*c*) fluid velocity leaving
(*d*) none of these

612. The most serious disadvantage of an orificemeter is that
(*a*) it is not very accurate.
(*b*) it is very costly.
(*c*) most of the pressure drop is not recoverable.
(*d*) it is not suitable for measuring gas flow.

613. The range of a particular rotameter can be increased by
(*a*) use of floats of different densities.
(*b*) no means.
(*c*) increasing the diameter of the float.
(*d*) decreasing the diameter of the float.

614. For turbulent fluid flow in pipe, the expression for Prandtl one seventh power law is
(*a*) $V/V_{max} = (x/r)^{1/7}$ (*b*) $V/V_{max} = (r/x)^{1/7}$
(*c*) $V/V_{max} = (x.r)^{1/7}$ (*d*) none of these
where, r = pipe radius, x = distance.

615. Slugging occurs in a fluidised bed, if the bed is
(*a*) narrow (*b*) deep
(*c*) both (*a*) & (*b*) (*d*) neither (*a*) nor (*b*)

616. With diminishing cross-sectional area in case of subsonic flow in a converging nozzle, the
(*a*) velocity increases
(*b*) pressure decreases
(*c*) both (*a*) & (*b*)
(*d*) neither (*a*) nor (*b*)

617. With increase in the shear rate, the apparent viscosity of pseudoplastic fluids
(*a*) increases (*b*) decreases
(*c*) remains same
(*d*) may increase or decrease; depends on the magnitude of shear rate

618. The most suitable flow measuring device for the fluid flow measurement in a very large diameter pipeline is a
(*a*) weir (*b*) pitot tube
(*c*) Kennison nozzle
(*d*) *V*-notch

619. What is the normal range of exit cone angle of a venturimeter ?
(*a*) 2 to 5 (*b*) 7 to 15
(*c*) 15 to 25 (*d*) > 25

620. Which of the following is used for very accurate measurement of flow of gas at low velocity ?
(*a*) Pitot tube (*b*) Rotameter
(*c*) Segmental orificemeter
(*d*) Hot wire annemometer

621. For the production of very high vacuum, a.....pump is normally used.
(*a*) diffusion (*b*) centrifugal
(*c*) jet ejector (*d*) piston

622. The equivalent diameter for pressure drop calculation for a fluid flowing through a rectangular cross-section channels having sides '*x*' & '*y*' is given by
(*a*) $\frac{2xy}{x+y}$ (*b*) $\frac{xy}{x+y}$
(*c*) $\frac{x+y}{2xy}$ (*d*) $\frac{x+y}{xy}$

623. What is the ratio of fluid carrying capacity of two pipes having diameters d_1 and d_2 respectively ?
(*a*) $\left(\frac{d_1}{d_2}\right)^{0.8}$ (*b*) $\left(\frac{d_1}{d_2}\right)^{0.5}$
(*c*) $\left(\frac{d_1}{d_2}\right)$ (*d*) $\left(\frac{d_1}{d_2}\right)^{2}$

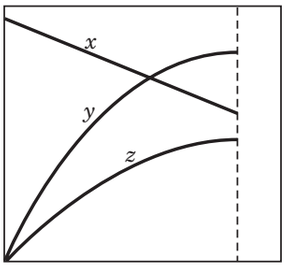
624. Laminar flow of a Newtonion fluid ceases to exist, when the Reynolds number exceeds
(*a*) 4000 (*b*) 2100
(*c*) 1500 (*d*) 3000

625. What is the shear rate at the pipe wall, in case of laminar flow of Newtonion fluids in a pipe of diameter '*D*' & length '*L*' incurring a pressure drop 'Δp' with average velocity 'V_{avg}'?
(*a*) $D\ \Delta p/8L$ (*b*) $D\ \Delta p/4L$
(*c*) $8.\ V_{avg}/D$ (*d*) $4.\ V_{avg}/D$

626. In case of a pipe of constant cross-sectional area, the maximum fluid velocity obtainable is
(*a*) the velocity of sound.
(*b*) dependent on its cross-sectional area.
(*c*) dependent on fluid viscosity.
(*d*) dependent on fluid density.

627. Deformation drag, which is caused by widespread deformation of fluid around the immersed body
(*a*) occurs when N_{Re} is very small.
(*b*) is primarily a friction drag.
(*c*) is independent of body length.
(*d*) depends mainly on cross-sectional shape.

628. Characteristic curves for a centrifugal pump plotted against its capacity is shown in the diagram. *x*, *y* and *z* denote respectively



(*a*) efficiency, head and B.H.P.
(*b*) head, efficiency and B.H.P.
(*c*) B.H.P., efficiency and head
(*d*) efficiency, B.H.P. and head

629. A mono pump is a .....pump.
(*a*) centrifugal
(*b*) piston
(*c*) positive acting rotary
(*d*) a group of vacuum

630. The maximum delivery pressure of a reciprocating compressor may be about .....kg/cm^2.
(*a*) 1000 (*b*) 2000
(*c*) 3000 (*d*) 4000

631. The flow of gas along a pipe in the direction of decreasing pressure causes decrease in its
(*a*) viscosity (*b*) specific volume
(*c*) velocity (*d*) none of these

632. Critical velocity in a pipe flow
(*a*) increases as fluid viscosity increases.
(*b*) increases as pipe diameter increases.
(*c*) independent of fluid density.
(*d*) none of these.

633. The fluid property, due to which, mercury does not wet the glass is
(*a*) surface tension
(*b*) viscosity
(*c*) cohesion (*d*) adhesion

634. Pick out the wrong statement :
(*a*) The vacuum pressure is always the negative gauge pressure.
(*b*) The pressure of the liquid measured by a piezometer tube is the gauge pressure.
(*c*) Manometric liquid should have high surface tension.
(*d*) The point at which the resultant pressure on an immersed surface acts, is known as the centre of gravity.

635. Bernoulli's equation does not apply to the functioning of a/an
(*a*) venturimeter (*b*) orificemeter
(*c*) pitot tube (*d*) none of these

636. Maintenance cost of a..... pump for a particular duty is the least.
(*a*) centrifugal (*b*) reciprocating
(*c*) volute (*d*) gear

637. ..... pumps are a group of vacuum pumps.
(*a*) Hyter (*b*) Sump
(*c*) Mono (*d*) Submerged

638. The excess of the sum of pressure & velocity heads over the vapor pressure of the liquid at the suction is called the
(*a*) static submergence.
(*b*) net positive suction head (NPSH).
(*c*) cavitation sensitivity.
(*d*) priming.

639. The main factor on which the behaviour of a mass of fluidised solid depends mainly is the
(*a*) fluid characteristics
(*b*) particle size
(*c*) both (*a*) and (*b*)
(*d*) neither (*a*) nor (*b*)

640. Pumping of a corrosive liquid is generally preferred to be done by a ..... pump, as it can be made of a variety of materials including plastics.
(*a*) piston (*b*) gear
(*c*) positive displacement
(*d*) sump

641. The uniformity of a gas fluidised bed depends upon the ..... of the solid particles.
(*a*) size (*b*) surface properties
(*c*) both (*a*) & (*b*) (*d*) neither (*a*) nor (*b*)

642. Which of the following is not an advantage of fluidisation from transfer operation point of view ?
(*a*) Intimate contact of the fluid with all parts of the solid particles.
(*b*) Lower fluid pumping power requirement.
(*c*) Minimisation of temperature variation.
(*d*) Prevention of particle seggregation.

643. Velocity of liquid hydrocarbon fuels in a pipeline can not be measured by magnetic flowmeters, because their ..... is very low/small.
(*a*) thermal conductivity
(*b*) electrical conductivity
(*c*) specific gravity
(*d*) electrical resistivity

644. The phenomenon occuring during pumping of a liquid solution containing dissolved gases, which may come out of the solution giving rise to gas pockets, is termed as
(*a*) evaporation (*b*) cavitation
(*c*) sublimation (*d*) stripping

645. Which of the following gives the shear stress at the boundary of flat plate?
(*a*) $\left|\mu \cdot \frac{\partial u}{\partial y}\right|_{y=0}$ (*b*) $\left|\rho \cdot \frac{\partial u}{\partial y}\right|_{y=0}$
(*c*) $\left|v \cdot \frac{\partial u}{\partial y}\right|_{y=0}$ (*d*) none of these

646. With increase in the ratio of orifice diameter to pipe diameter, the fraction of the orifice pressure differential that is permanently lost
(*a*) increases (*b*) decreases
(*c*) remains unchanged
(*d*) increases exponentially

647. Most of the centrifugal pumps used in chemical plants are usually ..... driven.
(*a*) steam (*b*) diesel engine
(*c*) electric motor (*d*) gas turbine

648. Momentum transfer in laminar flow of fluids results due to the
(*a*) viscosity (*b*) density
(*c*) velocity gradient
(*d*) none of these

649. An ideal nozzle design aims at
(*a*) minimising wall friction.
(*b*) suppressing boundary layer separation.
(*c*) both (*a*) & (*b*).
(*d*) neither (*a*) nor (*b*).

650. For one dimensional flow of an incompressible fluid in unsteady state in x-direction, the continuity equation is given by
(*a*) $\frac{\partial u}{\partial x} = 0$ (*b*) $\frac{\partial (\rho u)}{\partial x} = 0$
(*c*) $\frac{\partial u}{\partial x} = -\frac{\partial \rho}{\partial t}$ (*d*) $\frac{\partial \rho}{\partial t} = 0$

651. What is the value of co-efficient of discharge for square edged circular orifice (for $\beta = 0.3$ to 0.5) ?
(*a*) 0.61 - 0.63 (*b*) 0.5 - 0.75
(*c*) 0.75 - 0.90 (*d*) 0.35 - 0.55

652. The velocity profile exhibited by laminar flow of Newtonion fluids is such that the velocity distribution w.r.t. radius of the circular pipe is a/an ..... with the apex at the centre line of the pipe.
(*a*) hyperbola (*b*) parabola
(*c*) semi-circle (*d*) semi-ellipse

653. Applicability of Bernoulli's equation is limited to a/an ..... fluid, that does not exchange shaft work with the surroundings.
(*a*) incompressible (*b*) non-viscous
(*c*) both (*a*) and (*b*)
(*d*) neither (*a*) nor (*b*)

654. Pick out the wrong statement.
(*a*) Momentum transfer in laminar flow results from veclocity gradient.
(*b*) A fluid in equilibrium is not free from shear stress.
(*c*) The viscosity of a non-Newtonion fluid is a function of temperature only.
(*d*) both (*b*) and (*c*)

655. The terminal velocity of a particle moving through a fluid varies as d_p^n. The value of n is equal to ..... in Stoke's law regime.
(*a*) 1 (*b*) 0.5
(*c*) 2 (*d*) 1.5

656. In question No. 655, what is the value of 'n' for Newton's law regime ?
(*a*) 0.5 (*b*) 1
(*c*) 1.5 (*d*) 3

657. The Reynolds number for an ideal fluid flow is
(*a*) 4 (*b*) 2100-4000
(*c*) 4000 (*d*) ∞

658. Isothermal turbulent flow of a fluid results in decrease of its pressure, which depends on the
(*a*) wall roughness.
(*b*) Reynolds number.
(*c*) both (*a*) & (*b*).
(*d*) neither (*a*) nor (*b*).

659. The pressure drop per unit length of pipe incurred by a fluid '*X*' flowing through pipe is Δp. If another fluid '*Y*' having both the specific gravity & density just double of that of fluid '*X*', flows through the same pipe at the same flow rate/average velocity, then the pressure drop in this case will be
(*a*) Δp (*b*) $2\Delta p$
(*c*) Δp^2 (*d*) $\Delta p/2$

660. The time taken for gravity flow of a fixed volume of liquid (as in Redwood viscometer) is directly proportional to its
(*a*) absolute viscosity.
(*b*) ratio of absolute viscosity to density.
(*c*) density.
(*d*) Reynolds number.

661. Pick out the wrong statement.
(*a*) The shear stress at the pipe (dia = *D*, length = *L*) wall in case of laminar flow of Newtonion fluids is $\frac{D}{4L} \cdot \Delta p$.
(*b*) In the equation, $\tau \cdot g_c = k \cdot \left(\frac{du}{dy}\right)^n$, the value of '*n*' for pseudoplastic and dilatent fluids are < 1 and >1 respectively.
(*c*) Shear stress for Newtonion fluid is proportional to the rate of shear in the direction perpendicular to motion.
(*d*) With increase in the Mach number >0.6, the drag co-efficient decreases in case of compressible fluids.

662. The equation relating friction factor to Reynold number, $f^{-0.5} = 4 \log_e (N_{Re}/\sqrt{f})^{-0.4}$, is called the ..... equation.
(*a*) Nikuradse (*b*) Von-Karman
(*c*) Blausius (*d*) Colebrook

663. N_{Re}^2/N_{Fr} is called the ..... number.
(*a*) Brinkman (*b*) Galileo
(*c*) Archimedes (*d*) Euler

664. Which of the following is the 'Blaussius equation', relating friction factor to the Reynolds number ?
(*a*) $f = 0.079 \cdot N_{Re}^{0.25}$
(*b*) $f^{-0.5} = 4.07 \log_e (N_{Re}\sqrt{f})^{-0.6}$
(*c*) $f^{-0.5} = -4 \log_e \left[\frac{\varepsilon/D}{3.70} + \frac{1.26}{N_{Re} \cdot f^{0.5}}\right]$
(*d*) none of these

665. In question No. 664, the equation given in the option '(*b*)' is called the
(*a*) Colebrook formula
(*b*) Von-Karman equation
(*c*) Fanning equation
(*d*) none of these

666. Rubber latex is an example of a ..... fluid.
(*a*) pseudoplastic (*b*) bingham plastic
(*c*) dilatent (*d*) Newtonion

667. Colebrook equation for friction factor in turbulent flow is given by, $f^{-0.5} = -4\log_e\left[\frac{\varepsilon}{D} + \frac{1.26}{N_{Re}\sqrt{F}}\right]$. It reduces to Nikuradse equation for a value of $\frac{\in}{D}$ equal to
(*a*) 0 (*b*) 1
(*c*) ∞ (*d*) 0.5

668. When a fluid flows over a solid surface, the
(*a*) velocity is uniform at any cross-section.
(*b*) velocity gradient is zero at the solid surface.
(*c*) resistance between the surface & the fluid is lesser as compared to that between the fluid layers themselves.
(*d*) velocity is not zero at the solid surface.

669. An ideal plastic substance indicates no deformation, when stressed upto yield stress, but behaves like a Newtonion fluid beyond yield stress. Which of the following is an ideal plastic ?
(*a*) Sewage sludge (*b*) Rubber latex
(*c*) Blood (*d*) Sugar solution

670. ..... is used for measuring the static pressure exerted on the wall by a fluid flowing parallel to the wall in a pipeline.
(*a*) Venturimeter (*b*) Pressure gauge
(*c*) Pitot tube (*d*) Orificemeter

671. Viscosity of water is about ..... times that of air at room temperature.
(*a*) 15 (*b*) 55

(*c*) 155 (*d*) 1050

672. Centre of pressure of a plane surface of arbitrary shape immersed vertically in a static mass of fluid

(*a*) lies above the centroid of the plane surface.

(*b*) is independent of the specific weight of the fluid.

(*c*) is different for different fluids.

(*d*) is at the centroid of the plane surface.

673. The location of centre of pressure, which defines the point of application of the total pressure force on the surface, can be calculated by applying the principle of moments according to which "sum of the moment of the resultant force about an axis is equal to the sum of the components about the same axis". The centre of pressure of a rectangular surface (of width '*w*') immersed vertically in a static mass of fluid is at a depth of

(*a*) $\frac{1}{y/3}$ (*b*) $2y/3$

(*c*) $\frac{1}{y/4}$ (*d*) $3y/4$

where, y = depth of the liquid

674. In case of laminar flow of fluid through a circular pipe, the

(*a*) shear stress over the cross-section is proportional to the distance from the surface of the pipe.

(*b*) surface of velocity distribution is a paraboloid of revolution, whose volume equals half the volume of circumscribing cylinder.

(*c*) velocity profile varies hyperbolically and the shear stress remains constant over the cross-section.

(*d*) average flow occurs at a radial distance of 0.5 r from the centre of the pipe (r = pipe radius).

675. In case of turbulent flow of fluid through a circular pipe, the

(*a*) mean flow velocity is about 0.5 times the maximum velocity.

(*b*) velocity profile becomes flatter and flatter with increasing Reynolds number.

(*c*) point of maximum instability exists at a distance of $2r/3$ from the pipe wall (r = pipe radius).

(*d*) skin friction drag, shear stresses, random orientation of fluid particles and slope of velocity profile at the wall are more.

676. Which of the following equations as suggested by Colebrook and White gives the increase in roughness of a new surface (ε_o) with age/time (t) ?

(*a*) $\varepsilon = \varepsilon_o + \alpha.t$ (*b*) $\varepsilon = \varepsilon_o + \alpha.t^2$

(*c*) $\varepsilon = \varepsilon_o + \alpha.t^3$ (*d*) $\varepsilon = \varepsilon_o + \alpha.t^4$

where, ε = roughness of the surface after time 't'.

α = a co-efficient to be experimentally determined.

677. The maximum discharge through a circular channel takes place, when the depth of the fluid flow is ..... times the pipe diameter.

(*a*) 0.25 (*b*) 0.5

(*c*) 0.66 (*d*) 0.95

678. Fluid flow at increasing rate through a diverging pipe is an example of..... flow.

(*a*) steady uniform (*b*) non-steady uniform

(*c*) steady non-uniform

(*d*) non-steady non-uniform

679. In case of unsteady fluid flow, conditions & flow pattern change with the passage of time at a position in a flow situation. Which of the following is an example of unsteady flow ?

(*a*) Discharge of water by a centrifugal pump being run at a constant rpm.

(*b*) Water flow in the suction and discharge pipe of a reciprocating pump.

(*c*) Water discharge from a vertical vessel in which constant level is maintained.

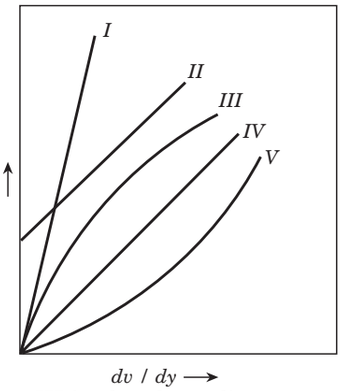
(*d*) Low velocity flow of a highly viscous liquid through a hydraulically smooth pipe.

680. During fluid flow, variation of shear stress (τ) with velocity gradient $\left(\frac{dv}{dy}\right)$ at constant pressure & temperature is shown below in the figure.

In the above figure, Binghom plastic is represented by the curve

(*a*) V (*b*) II

(*c*) III (*d*) I



681. Curve III in the above diagram represents a/an

(*a*) dilatent fluid (*b*) pseudo plastic fluid
(*c*) ideal plastic (*d*) none of these

682. Match the following dimensionless number encountered in problems of fluid mechanics.

List I

(*a*) Euler number (*b*) Weber number
(*c*) Cauchy number
(*d*) Ohnesorge number

List II

I. Bubble formation and break up of liquid jets
II. Compressible flow of fluids
III. Atomisation of liquid
IV. Fluid friction in conduit

683. Match the following fluid flow equations.

List I

(*a*) $f = 16/N_{Re}$ (*b*) $f = 0.079\, N_{Re}^{-0.25}$
(*c*) $D_V = kT/6\pi\, r_o\, \mu$
(*d*) $4f = 0.005 + \dfrac{0.396}{N^{Re^{0.3}}}$

List II

I. Blassius equation
II. Stoke's-Einstein equation
III. Darcy equation
IV. Nikuradse equation

684. Match the units of following parameters used in fluid flow.

List I

(*a*) Friction factor
(*b*) dynamic viscosity
(*c*) Kinematic viscosity
(*d*) Specific viscosity

List II

I. gm/cm. second II. cm^2/second
III. dimensionless IV. dimensionless

685. Match the typical examples of various types of fluids.

List I

(*a*) Bingham plastic
(*b*) Dilatent fluid
(*c*) Pseudo plastic fluid
(*d*) Thixotropic fluid

List II

I. Quicksand and starch suspensions in water
II. Polymeric solutions/melts and suspension of paper pulp
III. Drilling muds, paints and inks
IV. Sewage sludge and water suspensions of rock

686. Match the expression for the following parameters encountered in fluid flow.

List I

(*a*) Momentum correction factor
(*b*) Kinetic energy correction factor
(*c*) Velocity head
(*d*) Kinematic viscosity

List II

I. $V^2/2g_c$ II. μ/ρ
III. $\dfrac{1}{S}\int_S \left(\dfrac{u}{V_{av}}\right)^3 dS$ IV. $\dfrac{1}{S}\int_S \left(\dfrac{u}{V_{av}}\right)^2 dS$

687. Match the various fluid flow conditions with their examples.

List I

(*a*) Non steady uniform flow
(*b*) Steady non-uniform flow
(*c*) non-steady non-uniform flow
(*d*) steady uniform flow

List II

I. Increasing/decreasing fluid flow rate through a constant cross-section pipe.
II. Constant fluid flow rate through a converging/diverging pipe.
III. Increasing/decreasing fluid flow rate through a converging/diverging pipe.
IV. Constant fluid flow rate in a constant cross-section pipeline.

688. Match the following fluid flow situations.

List I

(*a*) Stable floating bodies
(*b*) Hyper sonic flow

(*c*) Free vortex motion
(*d*) Pressureless fluid flow

List II

I. Mach number > 5
II. Fluid flow in the volute casing outside the rotating impeller of a centrifugal pump.
III. Fluid motion is bounded on three sides and fourth side is exposed to atmosphere.
IV. Centre of gravity below metacentre.

689. Match the symbols of various pumps as used in chemical engineering drawings.

List I

(*a*) Centrifugal pump
(*b*) Reciproctaing pump
(*c*) Gear pump
(*d*) Diaphragm pump

I.  *II.* 

III.  *IV.* 

List II

690. Match the symbols of various pumps as used in chemical engineering drawings.

List I

(*a*) Positive displacement (mono) pump
(*b*) Ejector/air lift pump
(*c*) Submerged suction pump
(*d*) Proportioning (metering) pump

List II

I.  *II.* 

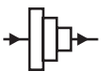
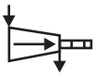
III.  *IV.* 

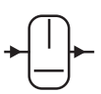
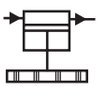
691. Match the symbols of various compressors used in chemical plants.

List I

(*a*) Axial flow/centrifugal compressor
(*b*) Vane compressor
(*c*) Reciprocating ccompressor
(*d*) Multi-stage turbo compressor

List II

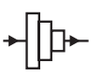
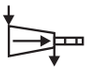
 

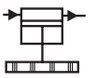
692. Match the symbols of various fans/blowers used in chemiccal plants.

List I

(*a*) Rootes type blower
(*b*) Rotary fan/blower
(*c*) Induced draft fan
(*d*) Axial fan

List II

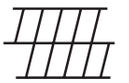
 

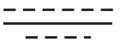
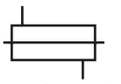
693. Match the symbols of various types of pipelines used in chemical plants

List I

(*a*) Lagged pipe
(*b*) Heated/cooled pipe
(*c*) Steam jacketted pipe
(*d*) Flexible pipe/hose

List II

I.  *II.* 

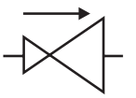
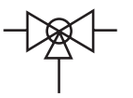
III.  *IV.* 

694. Match the symbols of various funcctional valves used in fluid flow piping systems.

List I

(*a*) Check (non return) valve
(*b*) Relief valve
(*c*) Mixing valve (hand operated)
(*d*) Reducing valve

List II

I.  *II.* 

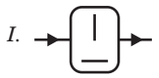
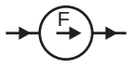
III.  *IV.* 

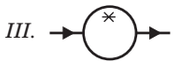
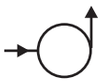
695. Match the symbols of various machineries used for fluid flow as found in chemical engineering drawing.

List I

(*a*) Forced draft fan
(*b*) Vane pump/screw pump
(*c*) Hydraulic pump
(*d*) Horizontal mounted pump

List II

I.  II. 

III.  IV. 

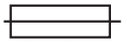
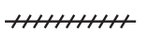
696. Match the symbols of various configuration of pipelines used for fluid flow in chemical process plants.

List II

(*a*) Perforated pipe
(*b*) Pipe below floor/ground level
(*c*) Existing pipeline to be removed
(*d*) Sleeved pipe

List II

I. II.

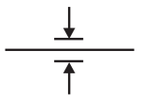
III.  IV. 

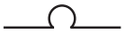
697. Match the symbols of various auxiliaries attached to pipework used in fluid flow operation in chemical plants.

List I

(*a*) Guide for pipelines
(*b*) Flanged and bolted pipe joint (flanges-welded on)
(*c*) Horseshoe type expansion joint
(*d*) End cap (flanged and bolted)

List II

I.  II. 

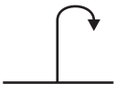
III.  IV. 

698. Match the symbols of various pipe fittings used in fluid flow operation.

List I

(*a*) Pipe drain
(*b*) Pipe vent (open)
(*c*) Pipe reducer (concentric)
(*d*) Fusible plug

List II

I.  II. 

III.  IV. 

699. Dean number is concerned with the
(*a*) fluid-particle interaction.
(*b*) fluid flow through helical pipes.
(*c*) power consumption in agitated vessels.
(*d*) psychrometry.

700. Which of the following is not concerned with the fluid-particle interaction ?
(*a*) Drag co-efficient
(*b*) Froude number
(*c*) Galileo number
(*d*) Weber number

701. Venturimeters, orificemeters and nozzles are used to measure the fluid discharge from a pipeline. The average fluid velocity in a pipeline can be measured by a/an
(*a*) weir
(*b*) hot wire anemometer
(*c*) cup and vane aneometer
(*d*) none of these

702. Pick out the correct statement.
(*a*) Human blood is a Newtonion fluid.
(*b*) A Newtonion fluid obeys Newton's law of cooling.
(*c*) For a non-Newtonion fluid, a straight line passes through the origin in a plot between shear stress and shear gradient.
(*d*) Thin lubricating oil is an example of a non-Newtonion fluid.

703. Fluid flow in a/an.....is an example of pressure flow.
(*a*) partially filled pipeline
(*b*) pipe
(*c*) open channel (*d*) river.

704. Mach number is defined as the ratio of the local flow velocity to the sonic velocity in the fluid. For what value of Mach number, the gases are considered incompressible ?
(*a*) < 0.3 (*b*) > 3
(*c*) 50 (*d*) 1

705. In case of hydraulically smooth pipe, the resistance to flow depends only on the Reynolds number, whereas for a hydraulically rough pipe, the resistance to flow is governed by the relative roughness. Two pipes are said to have the same hydraulic roughness, when they have equal values of
(*a*) relative roughness.
(*b*) absolute roughness.

(*c*) friction co-efficient for flows at equal Reynold number.
(*d*) all (*a*), (*b*) & (*c*).

706. In case of a pipe exit fitted with a nozzle, the
(*a*) conversion of kinetic head to pressure head is facilitated.
(*b*) conversion of pressure head to kinetic head is facilitated.
(*c*) power transmitted through the nozzle is maximum, when the head lost due to friction in the pipe is equal to one third of the total supply head.
(*d*) both (*b*) and (*c*)

707. Water hammer is caused, when water flowing in a pipe is suddenly brought to rest by closing the valve. The extent of pressure thus produced due to water hammer depends on the
(*a*) pipe length
(*b*) fluid velocity in the pipe
(*c*) time taken to close the valve
(*d*) all (*a*), (*b*) and (*c*)

708. Which of the following exemplifies a three dimensional fluid flow ?
(*a*) Fluid flow at the inlet to a nozzle
(*b*) Fluid flow between parallel plates
(*c*) Viscous fluid flow between converging plates
(*d*) None of these

709. Pick out the wrong statement about a streamline.
(*a*) It is always parallel to the main direction of the fluid flow.
(*b*) It is a line across which there is no flow and it is equivalent to a rigid boundary.
(*c*) Streamlines intersect at isolated point of zero velocity and infintie velocity.
(*d*) The fluid lying between any two streamlines can be considered to be in isolation and the streamline spacing varies inversely as the velocity.

710. Transition from laminar flow to turbulent flow is aided by the
(*a*) surface roughness and curvature (*i.e.* sharp corners).
(*b*) vibration.
(*c*) pressure gradient and the compressibility of the flowing medium.
(*d*) all (*a*), (*b*) & (*c*).

711. The discharge co-efficient for an orificemeter does not depend upon the
(*a*) pipe length.
(*b*) ratio of pipe diameter to orifice diameter.
(*c*) type of orifice & the Reynolds number.
(*d*) pipe diameter.

712. Which of the following is an undesirable property of a manometric liquid ?
(*a*) Non-sticky & non-corrosive nature.
(*b*) High vapour pressure.
(*c*) Low viscosity & surface tension.
(*d*) Low co-efficient of thermal expansion.

713. Working principle of manometer comprises of balancing a coloumn of liquid against the pressure to be measured. Inclined tube manometer is especially used for the measurement of ..... pressure.
(*a*) small differential
(*b*) atmospheric
(*c*) absolute (*d*) gage

714. Pressure difference between two points in vessels, pipelines or in two different pipelines can be measured by a differential manometer. The pressure difference measured as the mm of water coloumn in case of mercury-water, differential manometer is equal to
(*a*) H (*b*) 12.6 H
(*c*) 13.6 H (*d*) 14.6 H
where, H = difference in height of mercury column in mm.

715. Hydrometer measures the specific gravity of liquids based on the principles of buoyancy. Pycnometer is used to measure the specific gravity of
(*a*) powder & grannular solids
(*b*) liquids
(*c*) low melting point semi-solids
(*d*) all '*a*', '*b*' & '*c*'

716. Location of vena-contracta in an orificemeter does not depend upon the
(*a*) type of orifice.
(*b*) density, viscosity & compressibility of the fluid.
(*c*) ratio of pipe diameter to orifice diameter.
(*d*) pipe roughness.

717. Hydraulic mean depth (D_m) for a circular pipe of diameter 'D' flowing full is 0.25 D. For a circular channel, at $D_m = 0.3\ D$, gives the condition for the maximum
(a) flow rate (b) mean velocity
(d) both 'a' & 'b' (d) neither 'a' nor 'b'

718. Efficiency of power transmission (η) through a circular pipe is given by $(h_t - h_f)/h_t$, which has a maximum value of ..... percent.
(a) 33.3 (b) 50
(c) 66.6 (d) 88.8

719. Pick out the wrong statement.
(a) A fluid mass is free from shearing forces, when it is made to rotate with a uniform velocity.
(b) Newton's law of viscosity is not applicable to the turbulent flow of fluid with linear velocity distribution.
(c) Laminar flow of viscous liquids is involved in the lubrication of various types of bearings.
(d) Rise of water in capillary tubes reduces with the increasing diameter of capillary tubes.

720. ..... forces do not act in case of fluid flow.
(a) Elastic (b) Tensile
(c) Vibratory (d) Centrifugal

721. Drag force acting on a body does not depend upon the
(a) density of the fluid.
(b) density of the body.
(c) velocity of the body.
(d) projected area of the body.

722. The buoyant force acting on a floating body is dependent on the
(a) viscosity of the liquid.
(b) weight of the liquid displaced.
(c) depth of immersion of the body.
(d) surface tension of the liquid.

723. Nature of fluid flow during the opening of a valve in a pipeline is
(a) laminar (b) unsteady
(c) steady (d) uniform

724. Co-efficient of discharge (C_d) is defined as actual discharge/theoretical discharge and is equal to $C_c \cdot C_v$; where C_c = Co-efficient of contraction and C_v = co-efficient of velocity. C_d of an orifice is usually about
(a) 0.42 (b) 0.62
(c) 0.82 (d) 0.98

725. Two piping system are said to be equivalent, when the ..... are same.
(a) fluid flow rate & friction loss
(b) length & friction factor
(c) diameter & friction factor
(d) length & diameter

726. A weir is used to measure the large water discharge rate from a river or from an open channel. A weir is not of ..... shape.
(a) circular (b) rectangular
(c) triangular (d) trapezoidal

727. Gradually varying fluid flow is an example of ..... flow.
(a) non-steady uniform
(b) non-steady non-uniform
(c) steady uniform
(d) steady non-uniform

728. Navier-Stokes equation is useful in the analysis of ..... fluid flow problems.
(a) non-viscous (b) viscous
(c) turbulent (d) rotational

729. Permanent pressure loss in a well designed venturimeter is about ..... percent of the venturi differential.
(a) 1 (b) 10
(c) 30 (d) 50

730. A globe valve is the most suitable for applications, in which
(a) fluid flow control is required.
(b) fluid contains dispersed solid particles.
(c) valve is required to be either fully open or fully closed.
(d) one way flow is required. [GATE' 98]

731. Hydraulic mean radius for flow through packed bed of spherical particle of size, 'D_p', with porosity 'ε' is
(a) $\frac{D_p}{6}\left(\frac{\varepsilon}{1-\varepsilon}\right)$ (b) $\frac{D_p}{6}\left(\frac{1-\varepsilon}{\varepsilon}\right)$
(c) $\frac{2}{3}D_p\left(\frac{1-\varepsilon}{\varepsilon}\right)$ (d) $\frac{2}{3}D_p\left(\frac{\varepsilon}{1-\varepsilon}\right)$
[GATE' 95]

732. Toothpaste is a
(a) Bingham plastic
(b) pseudoplastic
(c) Newtonion liquid
(d) dilatent [GATE' 96]

733. Fluidised beds are formed, when the
(*a*) fluid friction is zero
(*b*) gravity force is less than the fluid friction.
(*c*) pressure forces equal gravity forces.
(*d*) sum of the fluid friction and pressure forces is equal and opposite to gravity forces. [GATE' 96]

734. Stoke's equation is valid in the Reynolds number range
(*a*) 0.01 to 0.1 (*b*) 0.1 to 2
(*c*) 2 to 10 (*d*) 10 to 100
[GATE' 96]

735. In the laminar boundary layer flow over a flat plate, the ratio (δ/x) varies as :
(*a*) Re (*b*) $\sqrt{Re}$
(*c*) $1/Re$ (*d*) $Re^{-1/2}$
where, 'δ' is the boundary layer thickness and 'x' is the distance from the leading edge in the direction of flow. [GATE 2000]

736. A Newtonion liquid (ρ = density, μ = viscosity) is flowing with velocity v in a tube of diameter 'D'. Let Δp be the pressure drop across the length 'L'. For a laminar flow, Δp is proportional to
(*a*) $L\,\rho v^2/D$ (*b*) $D\,\rho\,v^2/L$
(*b*) $L\,\mu\,V/D^2$ (*d*) $\mu\,V/L$ [GATE '94]

737. For an ideal fluid flow, Reynolds number is
(*a*) 2100 (*b*) 100
(*c*) 0 (*d*) ∞ [GATE '95]

738. A pipe of I.D. 4 m is bifurcated into two pipes of I.D. 2 m each. If the average velocity of water flowing through the main pipe is 5 m/sec, the average velocity through the bifurcated pipes is
(*a*) 20 m/sec (*b*) 10 m/sec
(*c*) $5\sqrt{2}$ m/sec (*d*) 5 m/sec [GATE '99]

739. The hydrodynamic and thermal boundary layers will merge, when
(*a*) Prandtl number is one.
(*b*) Schmidt number tends to infinity.
(*c*) Nusselt number tends to infinity.
(*d*) Archimedes number is greater than 10000. [GATE '96]

740. Boundary layer separation is characterised by one of the conditions given below, where 'Re' is the Reynolds number for the flow. Select the appropriate conditions.
(*a*) Re << 1, accelerating flow
(*b*) Re >> 1, accelerating flow
(*c*) Re << 1, decelerating flow
(*d*) Re >> 1, decelerating flow [GATE '98]

741. Applying a pressure drop across a capillary results in a volumetric flow rate 'Q' under laminar flow conditions. The flow rate for the same pressure drop, in a capillary of the same length but half the radius is
(*a*) $Q/2$ (*b*) $Q/4$
(*c*) $Q/8$ (*d*) $Q/16$ [GATE 2001]

742. The shear stress-shear rate relationship for a liquid whose apparent viscosity decreases with increasing shear rate is given by
(*a*) $\tau_{yx} = -m\left[\frac{dV_x}{dy}\right]^{n-1}\frac{dV_x}{dy}$ for $n < 1$
(*b*) $\tau_{yx} = -m\left[\frac{dV_x}{dy}\right]^{n}$ for $n = 1$
(*c*) $\tau_{yx} = -m\left[\frac{dV_x}{dy}\right]^{n-1}\frac{dV_x}{dy}$ for $n > 1$
(*d*) $\tau_{yx} = -m\,.\,\frac{dV_x}{dy} + \tau_0$ [GATE '94]

743. For laminar flow of a shear thinning liquid in a pipe, if the volumetric flow rate is doubled, the pressure gradient will increase by a factor of
(*a*) 2 (*b*) < 2
(*c*) > 2 (*d*) 1/2 [GATE 2000]

744. The hydraulic radius for flow in a rectangular duct of cross-sectional dimension H, W is
(*a*) $\sqrt{\frac{HW}{\pi}}$ (*b*) $\frac{HW}{2\,(H+W)^2}$
(*c*) $\frac{HW}{4\,(H+W)^2}$ (*d*) $\frac{2\,HW}{(H+W)}$
[GATE '98]

745. A Pitot tube indicates 5 cm of water (manometer) when it is being used for measuring velocity of air. The velocity of air in m/sec is
(*a*) 5 (*b*) 14.1
(*c*) 56.22 (*d*) 28.2 [GATE '95]

746. A bed consists of particles of density 2000 kg/m^3. If the height of the bed is 1.5 metres and its porosity 0.6, the pressure drop required to fluidise the bed by air is
(*a*) 25.61 kPa (*b*) 11.77 kPa
(*c*) 14.86 kPa (*d*) 21.13 kPa
[GATE '96]

747. As the velocity V and thus the Reynolds number of a flow past a sphere increases from very low value, the drag force for Re << 1

(a) increases linearly with V.
(b) decreases linearly with V.
(c) decreases as V^2.
(d) none of these. [GATE '92]

748. Bed pressure drop in an air fluidised bed of catalyst particles ($\rho_p = 200$ kg/m^3, $D_p = 0.05$ cm) of 60 cm bed depth and bed porosity of 0.5 expressed in cm of water (manometer) is

(a) 90 (b) 60
(c) 45 (d) 30 [GATE '95]

749. In centrifugal pumps, cavitation occurs, when pressure of the impeller eye or vane becomes

(a) less than atmospheric pressure.
(b) more than liquid vapor pressure.
(c) less than liquid vapor pressure.
(d) more than atmospheric pressure.
[GATE '99]

750. A rotameter through which air at room temperature and atmospheric pressure is flowing gives a certain reading for a flow rate of 100 cc/sec. If helium (molecular weight 4) is used and rotameter shows the same reading, the flow rate (cc/sec) is

(a) 26 (b) 42
(c) 269 (d) 325 [GATE '96]

751. The inherent characteristic of an equal percentage valve relating flow rate 'q' with valve stem movement 'x' are described by the equation

(a) $\frac{dq}{dx} = K$ (b) $\frac{dq}{dx} = K.q$
(c) $\frac{dq}{dx} = \frac{K}{q}$ (d) $\frac{dq}{dx} = Kq^2$
[GATE 2001]

752. The mechanical energy equation $\left(\frac{V^2}{2} + gz + \frac{P}{\rho}\right)_2 = \left(\frac{V^2}{2} + gz + \frac{P}{\rho}\right)_1 - \frac{dW_s}{dm} - \frac{dW_t}{dm}$ has been obtained under which of the following assumptions ?

(a) The flow is steady
(b) The flow is incompressible.
(c) No viscous work is being done.
(d) Point 2 and 1 are on the same stream line. [GATE '92]

753. Pick out the wrong statement about cavitation.

(a) Sudden reduction of pressure in a fluid flow system caused by flow separation, vortex formation or abrupt closing of valve leads to cavitation.
(b) Cavitation may be caused due to boiling of liquid by decreasing the pressure resulting in formation & collapse of vapor cavities.
(c) Cavitation begins at higher static pressure and lower velocity in larger diameter pipelines resulting in audible noise.
(d) Large scale cavitation can not damage pipeline, restrict fluid flow and damage steam turbine blades.

754. In a fully turbulent flow ($Re > 10^5$) in a pipe of diameter 'd', for a constant pressure gradient, the dependence of volumetric flow rate of an incompressible fluid is

(a) d (b) d^2
(c) $d^{2.5}$ (d) d^4 [GATE 2000]

755. Vena-contracta pressure tapping is at a distance of ..... from the position of an orificemeter fitted in a pipe of internal diameter 'd'

(a) d (b) $0.5\,d$
(c) $2d$ (d) $4d$

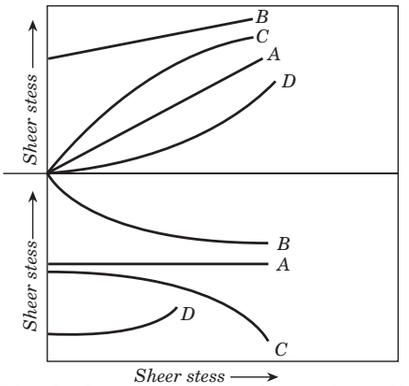
756. For Laminar flow through a packed bed, the pressure drop is proportional to (V_s is the superficial liquid velocity and D_p is the particle diameter)

(a) V_s/D_p^2 (b) V_s^2/D_p^2
(c) V_s^2/D_p^3 (d) V_s/D_p^3 [GATE '99]

757. Match the curves obtained on plotting shear rate against viscosity and shear stress for various non-Newtonion and Newtonion fluids as shown in the diagram.

List I
(a) Newtonion fluid
(b) Bingham plastic
(c) Pseudoplastic
(d) Dilatent fluid

List II
I. A II. C
III. B IV. D



758. Match the expressions for various dimensionless groups as encountered in different unit operations.

List I

(*a*) Drag co-efficient
(*b*) Fourier number
(*c*) Weber number
(*d*) Fanning friction factor

List II

I. $\alpha.t/r^2$ II. $D.\rho.\overline{V}^2/\sigma.g_c$
III. $\Delta p.g_c.D/2L\ \rho.\overline{V}^2$
IV. $2\ F_D g_c/\rho u_o^2.\ A_p$

759. Frictional losses in fittings & valves in terms of the equivalent length of straight pipe that would cause the same pressure drop is expressed as certain multiple of pipe diameter. Match the equivalent resistance of various pipe fittings & valves.

List I: Valves and fittings

(*a*) Gate valve (fully open)
(*b*) Globe valve (fully open)
(*c*) 45° elbow
(*d*) Socket/union/coupling

List II:

Equivalent resistance times pipe diameter

I. Negligible II. 15
III. 7 IV. 300

760. Match the type of pump used for various typical applications. [GATE '91]

List I

(*a*) Edible oil pumping.
(*b*) Crude oil pumping from oil wells.
(*c*) 98% sulphuric acid pumping.
(*d*) pumping of liquids containing suspension of abrasive solid.

List II

I. Diaphragm pump
II. Centrifugal pump
III. Gear pump
IV. Air lift pump

761. Match the type of pump used for various duties.

List I

(*a*) Pumping of highly viscous liquid.
(*b*) Pumping of boiler feed water.
(*c*) Lifting of high specific gravity liquid.
(*d*) Pumping of paper pulp.

List II

I. Plunger pump II. Siphon
III. Diaphragm pump IV. Gear pump

762. A spherical particle is falling slow in a viscous liquid such that Reynolds number is less than 1. Which statement is correct for this situation ?

(*a*) Inertial and drag forces are important.
(*b*) Drag, gravitational and buoyancy forces are impportant.
(*c*) Drag force and gravitational forces are important.
(*d*) None of the above. [GATE '92]

763. A particle A of diameter 10 microns settles in an oil of specific gravity 0.9 and viscosity 10 poise under Stoke's law. A particle B with diameter 20 microns settling in the same oil will have a settling velocity

(*a*) same as that of A.
(*b*) one fourth as that of A.
(*c*) twice as that of A.
(*d*) four times as that of A. [GATE '92]

764. For the laminar flow of a fluid in a circular pipe of radius R, the Hagen-Poisseule equation predicts the volumetric flow rate to be proportional to

(*a*) R (*b*) R^2
(*c*) R^4 (*d*) $R^{0.5}$ [GATE 97]

765. In the low Reynolds number region, the drag force on a sphere is proportional to

(*a*) V (*b*) V^2
(*c*) V^4 (*d*) $V^{0.5}$ [GATE 97]

766. The hydraulic diameter of an annulus of inner and outer radii R_i and R_o respectively is

(*a*) $4(R_o - R_i)$ (*b*) $\sqrt{R_o - R_i}$
(*c*) $2(R_o - R_i)$ (*d*) $R_o + R_i$ [GATE 97]

767. For laminar flow of a fluid through a packed bed of spheres of diameter d, the pressure drop per unit length of bed depends upon the sphere diameter as

(a) d (b) d^2
(c) d^4 (d) $\overline{d}^2$ [GATE 97]

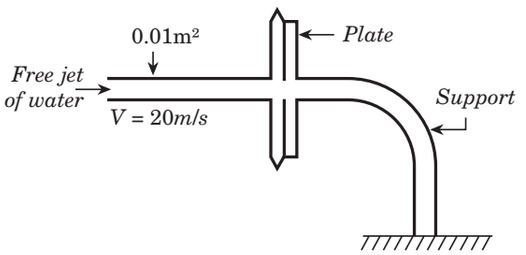
768. A 0.5 m high bed made up of a 1 mm dia glass sphere (density 2500 kg/m^3) is to be fluidised by water (density 1000 kg/m^3). If at the point of incipient fluidisation, the bed voidage is 40%, the pressure drop across the bed is

(a) 4.4 KPa (b) 2.94 KPa
(c) 3.7 KPa (d) none of these
[GATE 97]

769. Water is flowing at 1 m/sec through a pipe (of 10 cm I.D) with a right angle bend. The force in Newtons exerted on the bend by water is

(a) $10\sqrt{2}\,\pi$ (b) $5\pi/2$
(c) $5\sqrt{2}\,\pi$ (d) $5\pi/\sqrt{2}$ [GATE 99]

770. A free jet of water of cross-sectional area 0.01m^2 and a velocity of 20 m/s strikes a plate and then flows in a plane parallel to the plate as shown in the figure below. The horizontal component of the force on the support is



(a) 200 N (b) 400 N
(c) 2000 N (d) 4000 N
[GATE 2000]

771. A Bingham fluid of viscosity μ = 10 Pa.s and yield stress, τ_0 = 10 KPa, is shared between flat parallel plates separated by a distance of 10^{-3} m. The top plate is moving with a velocity of 1 m/s. The shear stress on the plate is

(a) 10 KPa (b) 20 KPa
(c) 30 KPa (d) 40 KPa
[GATE 2001]

772. With increasing flow rate, the hydraulic efficiency of a centrifugal pump

(a) monotonically decreases.
(b) decreases and then increases.
(c) remains constant.
(d) increases and then decreases.
[GATE 2002]

773. For flow past a flat plate, if x is the distance along the plate in the direction of flow, the boundary layer thickness is proportional to

(a) $\sqrt{x}$ (b) $1/\sqrt{x}$
(c) x (d) $1/x$ [GATE 2002]

774. For turbulent flow of an incompressible fluid through a pipe, the flow rate Q is proportional to $(\Delta P)^n$, where ΔP is the pressure drop. The value of exponent 'n' is

(a) 1 (b) 0
(c) < 1 (d) > 1 [GATE 2002]

775. The drag co-efficient for a bacterium moving in water at 1 mm/s, will be of the following order of magnitude (assume size of the bacterium to be 1 micron and kinematic viscosity of water to be 10^{-6} m^2/s).

(a) 24000 (b) 24
(c) 0.24 (d) 0.44 [GATE 2002]

776. A gas (density = 1.5 kg/m^3, viscosity = 2×10^{-5} kg/m.s) flowing through a packed bed (particle size = 0.5 cm, porosity = 0.5) at a superficial velocity of 2 m/s causes a pressure drop of 8400 Pa/m. The pressure drop for another gas, with density of 1.5 kg/m^3 and viscosity of 3×10^{-5} kg/m.s flowing at 3 m/s will be

(a) 8400 Pa/m (b) 18900 Pa/m
(c) 12600 Pa/m (d) 16800 Pa/m
[GATE 2002]

777. A lubricant 100 times more viscous than water would have a viscosity (in Pa.s)

(a) 0.01 (b) 0.1
(c) 1 (d) 10 [GATE 2003]

778. The velocity profile for a Bingham plastic fluid flowing (under laminar conditions) in a pipe is

(a) parabolic (b) flat
(c) flat near the wall and parabolic in the middle
(d) parabolic near the wall and flat in the middle.

779. The variable required to be known in correlations used for estimating the horse power of a centrifugal gas compressor and hence its cost are

P. Inlet pressure Q. Compressor rpm
R. Delivery pressure S. Volumetric flow rate at inlet

(*a*) P, Q and R
(*b*) P and R
(*c*) R and S
(*d*) P, R and S [GATE 2003]

780. A fluid element has a velocity $\underline{V} = -y^2 \,.\, \underline{xi} + 2yx^2 \,.\, \underline{j}$. The motion at $(x, y) = (1/\sqrt{2}, 1)$ is

(*a*) rotational and incompressible
(*b*) rotational and compressible
(*c*) irrotational and compressible
(*d*) irrotational and incompressible [GATE 2003]

781. A bed of spherical particles (specific gravity 2.5) of uniform size 1500 μm is 0.5 m in diameter and 0.5 m high. In packed bed state, the porosity may be taken as 0.4. Ergun's equation for the above fluid-particle system (in SI units) is given below :

$\Delta P/L = 375 \times 10^3 \, V_{OM} + 10.94 \times 10^6 \, V_{OM}^2$ (SI units)

If water is to be used as the fluidising medium, the minimum fluidisation velocity, V_{OM} is

(*a*) 12 mm/s (*b*) 16 mm/s
(*c*) 24 mm/s (*d*) 28 mm/s [GATE 2003]

782. In Q. No. 781, in actual operation, the above bed has a height = 1 m. What is the porosity of the fluidised bed ?

(*a*) 0.2 (*b*) 0.5
(*c*) 0.7 (*d*) 0.8 [GATE 2003]

783. The equivalent diameter for flow through a rectangular duct of width B and height H is

(*a*) $\frac{HB}{2(H+B)}$ (*b*) $\frac{HB}{(H+B)}$
(*c*) $\frac{2HB}{(H+B)}$ (*d*) $\frac{4HB}{(H+B)}$ [GATE 2004]

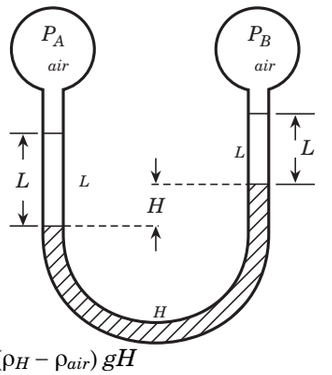
784. What is the force required (in Newtons) to hold a spherical balloon stationary in water at a depth of H from the air-water iterface? The balloon is of radius 0.1 m and is filled with air.

(*a*) $\frac{4\pi g}{3}$ (*b*) $\frac{0.1\,\pi gH}{4}$
(*c*) $\frac{0.1\,\pi gH}{8}$ (*d*) $\frac{0.04\pi gH}{3}$ [GATE 2004]

785. Viscosity of water at 40°C lies in the range of

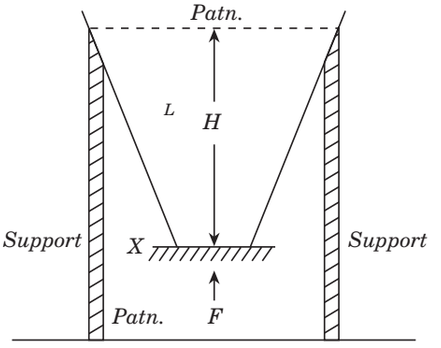
(*a*) 1×10^{-3} to 2×10^{-3} kg/m.s
(*b*) 0.5×10^{-3} to 1×10^{-3} kg/m.s
(*c*) 1 to 2 kg/m.s
(*d*) 0.5 to 1 kg/m.s [GATE 2004]

786. For the manometer set up shown in the figure, the pressure difference $P_A - P_B$ is given by



(*a*) $(\rho_H - \rho_{air})\, gH$
(*b*) $(\rho_H - \rho_L)\, gH$
(*c*) $(\rho_H - \rho_L)\, gH + (\rho_L - \rho_{air}) \,.\, g(L - H)$
(*d*) $(\rho_H - \rho_L)\, gL + (\rho_L - \rho_{air})\, gH$ [GATE 2004]

787. A conical tank with a bottom opening of cross-sectional area A is filled with water and is mounted on supports as shown in the figure. What is the force F with which plate X must be pushed up to prevent water from leaking ? Assume that the density of air is



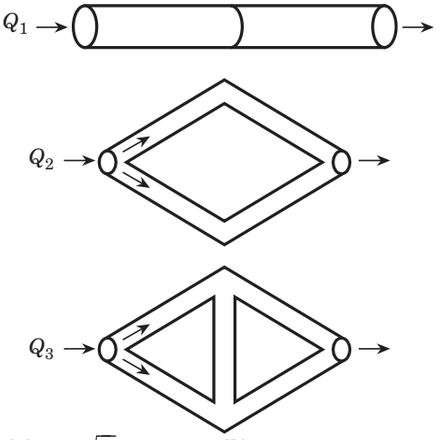
negligible as compared to the density of water ρ_L.

(*a*) $\rho_L \,.\, V_g$ (*b*) $\rho_L \,.\, A \,.\, Hg$

(*c*) $\rho_L \,.\, Vg/2$ (*d*) $\rho_L \,.\, Vg/3$

[GATE 2004]

788. Three piping networks as shown in the figure are placed horizontally. They are made using identical pipe segments and are subjected to the same pressure drop across them. Assuming no pressure losses at junctions, the flow rates across the three networks are related as $Q_1 : Q_2 : Q_3$.



(*a*) $1 : \sqrt{3} : 2$ (*b*) $1 : 2 : 3$

(*c*) $1 : 2 : 2$ (*d*) $1 : \sqrt{2} : \sqrt{2}$

[GATE 2004]

789. U_{mf} is the minimum fluidisation velocity for a bed of particles. An increase in the superficial gas velocity from $2\ U_{mf}$ to $2.5\ U_{mf}$ results in (all velocities are smaller than the entrainment velocity of the particles) no change in the

(*a*) drag on particles

(*b*) drag on coloumn walls

(*c*) bed height

(*d*) bed voidage [GATE 2004]

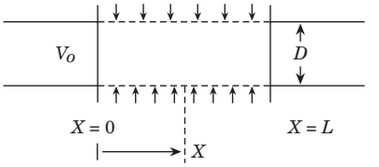
790. The Kozney-Carman equation, rewritten in terms of non-dimensional numbers gives $(\Delta P/pu^2)$ proportional to

(*a*) $\dfrac{(L/D_p)}{R_e}$ (*b*) $\dfrac{\text{Re}}{(D_p/L)}$

(*c*) $\dfrac{(L/D_p)}{R_e^2}$ (*d*) $\dfrac{R_e^2}{(D_p/L)}$

[GATE 2004]

791. A pipe has a porous section of length L as shown in the figure. Velocity at the start of this section of V_o. If fluid leaks into the pipe through the porous section at a volumetric rate per unit area $q(x/L)^2$, what will be axial velocity in the pipe at any x ? Assume incompressible one dimensional flow *i.e.*, no gradients in the radial direction.



(*a*) $V_x = V_o + q\,\dfrac{x^3}{L^2.D}$

(*b*) $V_x = V_o + \dfrac{1}{3}\,q\,\dfrac{x^3}{L^2}$

(*c*) $V_x = V_o + 2q\,\dfrac{x^2}{L.D}$

(*d*) $V_x = V_o + \dfrac{4}{3}\,q\,\dfrac{x^3}{L^2.D}$ [GATE 2003]

792. For a particle settling in water at its terminal settling velocity, which of the following is true ?

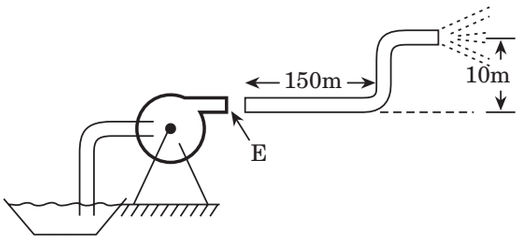
(*a*) Buoyancy = weight + drag

(*b*) Weight = buoyancy + drag

(*c*) Drag = buoyancy + weight

(*d*) Drag = weight [GATE 2004]

793. A centrifugal pump is used to pump water through a horizontal distance of 150 m, and then raised to an overhead tank 10 m above. The pipe is smooth with an I.D of 50 mm. What head (m of water) must the pump generate at its exit (*E*) to deliver water at a flow rate of 0.001 m^3/s? The Fanning friction factor, f is 0.0062.



(*a*) 10 m (*b*) 11 m

(*c*) 12 m (*d*) 20 m

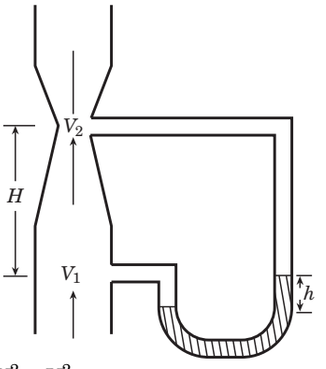
[GATE 2003]

794. For a sphere of density ρ_s and volume V placed in a fluid of density ρ

P. Weight	1. $(\rho_s - \rho)$
Q. Buoyancy force	2. $\rho_s.V_g$
	3. $(\rho_s + \rho)V_g$

(*a*) $P-3, Q-2$ (*b*) $P-3, Q-1$
(*c*) $P-1, Q-2$ (*d*) $P-2, Q-3$
[GATE 94]

795. The pressure differential across a vertical venturimeter (shown in figure) is measured with the help of a mercury manometer to estimate flow rate of water flowing through it. The expression for the velocity of water at the throat is



(*a*) $\dfrac{V_2^2 - V_1^2}{2g} = h\ \rho_m/\rho_f$

(*b*) $\dfrac{V_2^2 - V_1^2}{2g} = h(\rho_m - \rho_w)/\rho_f$

(*c*) $\dfrac{V_2^2}{2g} = H + h(\rho_m + \rho_w)/\rho_f$

(*d*) $\dfrac{V_2^2 - V_1^2}{2g} = h(\rho_m - \rho_w)/\rho_f$ [GATE 2003]

796. Match the following dimensioless numbers with the appropriate ratio of forces.

Dimensionless number
P. Froude number
Q. Reynolds number
R. Friction factor
S. Nusselt number

Ratio of forces
1. Shear force/inertial force
2. Convective heat transfer/Conductive heat transfer
3. Gravitational force/viscous force
4. Inertial force/viscous force
5. Inertial force/gravitational force

(*a*) $P-1, Q-2, R-5, S-3$
(*b*) $P-5, Q-4, R-3, S-2$
(*c*) $P-5, Q-4, R-1, S-2$
(*d*) $P-3, Q-4, R-5, S-1$ [GATE 2003]

797. The dependence of the volumetric flow rate Q on the pressure drop is given by, $\Delta P \propto Q^n$, for different flow regimes. Match the exponent 'n' to each of the flow regimes given below

Flow regime	*Value of exponent 'n'*
P. Laminar flow	1. $n < 0.05$
Q. Turbulent flow	2. $n = 0.5$
	3. $n = 1.0$
	4. $n > 1.0$

(*a*) $P-3, Q-4$ (*b*) $P-1, Q-3$
(*c*) $P-3, Q-1$ (*d*) $P-2, Q-4$
[GATE 98]

798. Match the item in the left hand column to the appropriate item in the right hand coloumn.

P. Gear pump	1. Suspension
Q. Air lift pump	2. Concentrated sulphuric acid
	3. Viscous oil
	4. Toluene

(*a*) $P-1, Q-4$ (*b*) $P-2, Q-3$
(*c*) $P-3, Q-1$ (*d*) $P-2, Q-4$
[GATE 96]

799. Match the item in the left hand column to the appropriate item in right hand coloumn.

P. 1/7th power law	1. Irrotational flow
Q. Hagen-Poiseulle equation	2. Turbulent flow
	3. Inviscid flow
	4. Laminar flow in pipes

(*a*) $P-1, Q-3$ (*b*) $P-2, Q-3$
(*c*) $P-3, Q-1$ (*d*) $P-1, Q-4$
[GATE 96]

800. Match the item in the left hand coloumn with the appropriate item in the right hand coloumn.

P. Venturimeter	1. Static head
Q. Wet gas meter	2. Kinetic energy
	3. Volumetric displacement
	4. Fluid drag force

(*a*) $P-1, Q-3$ (*b*) $P-2, Q-3$
(*c*) $P-2, Q-4$ (*d*) $P-1, Q-2$
[GATE 95]

801. ..... flow is indicated by the value of Mach number equal to unity.
(*a*) Turbulent (*b*) Sonic
(*c*) Super-sonic (*d*) Sub-sonic

802. What is the approximate value of friction factor for smooth pipes with the turbulent flow ($N_{Re} = 10^6$) ?
(*a*) 0.1 (*b*) 0.01
(*c*) 0.001 (*d*) 0.0001

803. What is the value of Reynold's number at which the flow turns turbulent from laminar in case of flow over flat plate ?
(*a*) 1×10^5 (*b*) 5×10^5
(*c*) 50×10^5 (*d*) 4000

804. With increasing radius, the velocity in free vortex & forced vertex respectively.
(*a*) decreases & increases
(*b*) increases & decreases
(*c*) decreases & remains constant
(*d*) remains constant & decreases

805. Darcy friction factor for laminar flow ($N_{Re} = 800$) in a pipe is equal to
(*a*) 0.02 (*b*) 0.04
(*c*) 0.08 (*d*) 0.008

806. Approximate kinetic energy correction factor for laminar and turbulent flow respectively are:
(*a*) 2 and 1 (*b*) 1 and 2
(*c*) 2 and 3 (*d*) 4 and 1

807. It is possible to run pumps in parallel provided their .....heads are similar.
(*a*) suction (*b*) discharge
(*c*) closed-valve (*d*) none of these

808. The operating point in a pumping system is identified by the point of intersection of the
(*a*) system curve and the efficiency curve.
(*b*) system curve and the pump curve.
(*c*) theoretical power curve and the pump curve.
(*d*) none of these

809. Small by-pass lines are installed sometimes in pumps to
(*a*) reduce the pumping power consumption
(*b*) control the pump delivery head
(*c*) prevent pump running at zero flow
(*d*) save energy

810. With increasing ratio of orifice diameter to pipe diameter, the fraction of orifice differential that is permanently lost (in an orificemeter)
(*a*) increases linearly
(*b*) increases exponentially
(*c*) decreases
(*d*) remains unchanged

811. .....equation is applicable for flow of fluid through a packed bed for large Reynold's number.
(*a*) Kremser (*b*) Blake-Plummer
(*c*) Kozney-Karman
(*d*) None of these

812. Navier-Stokes equation deals with the law of conservation of
(*a*) mass (*b*) energy
(*c*) momentum (*d*) none of these

813. With increasing spherical particle size, the operating range of fluidisation velocity
(*a*) decreases (*b*) increases
(*c*) remains the same
(*d*) increases exponentially

814. Net positive suction head (NPSH) for a centrifugal pump in defined as
(*a*) $h_{vs} + h_{ps} - p_s$ (*b*) $h_{vs} + h_{ps} + p_s$
(*c*) $h_{vs} + h_{ps}$ (*d*) $h_{vs} - h_{ps}$

where, h_{vs} = velocity head at suction
h_{ps} = pressureheadatsuction
p_s = vapour pressure of liquid at suction temperature

815. What fraction of the volume of an alloy steel piece (sp.gr = 6.8) will be under mercury while it floats in it?
(*a*) 0.50 (*b*) 0.25
(*c*) 0.75 (*d*) 0.95

816. Magnitude of water hammer caused by water flowing in the pipeline does not depend upon the
(*a*) rapidity with which a valve in the pipeline is closed
(*b*) length of the pipe
(*c*) elastic property of the water & pipe material
(*d*) none of these

817. Streamlines, streak lines and path lines are all identical in the case of ..... flow.
(*a*) steady (*b*) unsteady
(*c*) uniform (*d*) non-uniform

818. To replace a compound pipe by a new pipe, the pipes will be equivalant, when both the pipes have the same
(*a*) flow & length (*b*) flow & loss of head
(*c*) flow & diameter
(*d*) length & loss of head

819. A piezometer can not be used for pressure measurement in pipes, when the fluid
(*a*) velocity is high (*b*) viscosity is high
(*c*) pressure difference is low
(*d*) in the pipe is a gas

820. The upper surface of the weir over which water flows is known as the
(*a*) crest (*b*) vein
(*c*) nappe (*d*) sill

821. Which of the following formula is used for replacing a pipe of diameter '*D*' by '*n*' number of parallel pipes of diameter '*d*' ?
(*a*) $d = D \cdot n^{-2/5}$ (*b*) $d = D \cdot n^{-1}$
(*c*) $d = D \cdot \sqrt{n}$ (*d*) $d = D \cdot n^{-3/2}$

822. A turbulent fluid flow is considered hydraulically smooth, if the ratio of the height of roughness projection to thickness of laminar sub-layer is less than
(*a*) 0.25 (*b*) 0.50
(*c*) 0.75 (*d*) 1.0

823. The velocity distribution in the turbulent boundary layer follows the ..... law.
(*a*) parabolic (*b*) hyperbolic
(*c*) straight line (*d*) logarithmic

824. Stanton diagram is a plot of
(*a*) f *vs./ Re* (*b*) f *vs./* log *Re*
(*c*) log f *vs./ Re* (*d*) log f *vs./* log *Re*

where, f = Friction factor
and, *Re* = Reynold's number

825. The pressure of fluid due to water hammer is directly proportional to
(*a*) ρ (*b*) ρ^2
(*c*) $\sqrt{\rho}$ (*d*) $1/\sqrt{\rho}$

826. As the flow rate increases in a rotameter, the float
(*a*) drops in the tube
(*b*) rotates at lower speed
(*c*) rotates at higher speed
(*d*) rises in the tube

827. Match List I with List II and select the correct answer using the codes given below the lists:

List I
(*a*) streamlines (*b*) streaklines
(*c*) path lines
(*d*) equipotential lines

List II
I. Tracing of motion of any one fluid particle
II. Tracing of motion of different fluid particles
III. Identification of location of number of fluid particles
IV. Orthogonal to streak lines

	A	*B*	*C*	*D*
(*a*)	II	III	IV	I
(*b*)	III	II	I	IV
(*c*)	I	II	IV	III
(*d*)	II	III	I	IV

828. An error of 0.5% in the measurement of head in a V-notch causes an error of ..... per cent in the discharge.
(*a*) 0.75 (*b*) 1.25
(*c*) 1.50 (*d*) 1.75

829. An equipotential line has no velocity component tangent to it. The path traced by a single particle of smoke using from a cigarette is a
(*a*) flow line (*b*) streak line
(*c*) stream line (*d*) path line

830. Bernoulli's equation is applicable between any two points in ..... flow of an incompressible fluid.
(*a*) steady, irrotational
(*b*) steady. rotational
(*c*) any type of irrotational
(*d*) any type of rotational

831. Existence of velocity potential implies that the fluid is
(*a*) ideal (*b*) irrotational
(*c*) compressible (*d*) in continuum

832. Navier stokes equations are associated with
(*a*) buoyancy (*b*) supersonic flow
(*c*) viscosity (*d*) vortex flow

833. Match the following:

List I
A. Square root of the ratio of inertia force of a flowing fluid to the pressure force.
B. Square root of the ratio of inertia force of a flowing fluid to the gravity force.

C. Square root of the ratio of inertia force of a flowing fluid to the elastic force.
D. Square root of the ratio of inertia force of a flowing fluid to the surface tension.

List II

I. Weber number
II. Mach number
III. Froude number
IV. Euler number

(*a*) A-IV, B-III, C-II, D-I
(*b*) A-IV, B-III, C-I, D-II
(*c*) A-III, B-IV, C-II, D-I
(*d*) A-III, B-IV, C-I, D-II

834. The free air discharge (FAD) capacity of a reciprocating compressor is directly proportional to
(*a*) pressure (*b*) volume
(*c*) speed (*d*) all 'a', 'b' & 'c'

835. For every 4°C rise in the inlet air temperature in case of air compressors, the
(*a*) increase in energy consumption is by 1%
(*b*) decrease in energy consumption is by 2%
(*c*) increase in energy consumption is by 5%
(*d*) energy consumption remains the same

836. The purpose of an inter cooler in a reciprocating compressor is to
(*a*) reduce the temperature of air before it enters the next stage
(*b*) remove the moisture in air
(*c*) separate moisture and oil vapour
(*d*) none of these

837. Increase in delivery pressure of an air compressor by 1 bar would reduce the power consumption by ..... per cent.
(*a*) 2–4 (*b*) 6–8
(*c*) 10–12 (*d*) none of these

838. A centrifugal pump is delivering 200m^3/hr. The impeller diameter is trimmed by 10%. The new flow will be ..... m^3/hr.
(*a*) 100 (*b*) 180
(*c*) 200 (*d*) 222

839. If two similar pumps are running in series, the
(*a*) head is halved (*b*) head is doubled
(*c*) flow is halved (*d*) flow is doubled

840. If the delivery valve of the centrifugal pump is throttled such that it delivers 60% of the rated flow always, one of the best options for improved energy efficient pump operation would be
(*a*) trimming of the impeller of the pump
(*b*) replacing the motor of the pump
(*c*) replacing the existing pump with a smaller sized pump
(*d*) variable speed drive

841. Change in impeller diameter in a centrifugal pump are limited to reducing its diameter to about.....per cent of its maximum size.
(*a*) 35 (*b*) 50
(*c*) 60 (*d*) 75

842. Head losses for flow through valves & fittings are expressed in terms of
(*a*) drag co-efficient
(*b*) shape factor
(*c*) equivalent length of a straigh pipe
(*d*) roughness factor

843. A centrifugal fan is operating at 700 rpm developing a flow of 2000 Nm^3/hr at a static pressure of 600 mm water coloumn (mmWC). If the fan speed is reduced to 600 rpm, the static pressure will become ..... mmWC.
(*a*) 841 (*b*) 441
(*c*) 600 (*d*) 1050

844. Pick out the wrong statement pertaining to parallel operation of pumps.
(*a*) The system curve is usually not affected by the number of pumps that are running in parallel.
(*b*) For a system with a combination of static and friction head loss, the flow rate with two pumps running is double that of a single pump.
(*c*) For a system with a combination of static and friction head loss, the operating point of the pumps on their performance curves moves to a higher head.
(*d*) If the system head were only static, then flow rate would be proportional to the number of pumps operating.

845. A centrifugal pump is operating at 1440 rpm. If the power is to be reduced to 75% of its existing power, the speed of the pump as per affinity law will be ..... rpm.

(*a*) 360 (*b*) 540
(*c*) 1080 (*d*) 1308

846. Reciprocating air compressor efficiency does not depend upon the
(*a*) flow rate (*b*) suction pressure
(*c*) system air leakages
(*d*) discharge pressure

847. The flow output of which of the following changes with the discharge pressure ?
(*a*) Reciprocating compressor
(*b*) Screw compressor
(*c*) Centrifugal compressor
(*d*) None of these

848. For centrifugal fans, the relation between power (kW) and speed (N) is given by
(*a*) $\frac{KW_1}{KW_2} = \frac{N_1}{N_2}$ (*b*) $\frac{KW_1}{KW_2} = \frac{N_1^2}{N_2 N^2}$
(*c*) $\frac{KW_1}{KW_2} = \frac{N_1^3}{N_2 N^3}$ (*d*) $\frac{KW_1}{KW_2} = \frac{N_1^4}{N_2 N^4}$

849. The pressure-flow characteristic curve of a centrifugal fan changes with the following flow control method:
(*a*) Inlet damper (*b*) outlet damper
(*c*) inlet guide vane
(*d*) none of these

850. Which of the following is not true of air receivers?
(*a*) Stores large volume of air
(*b*) Increases the pressure of air
(*c*) Smoothens pulsating output
(*d*) A source for draining of moisture

851. The efficiency of forward curved fans compared to backward inclined fans is
(*a*) higher (*b*) lower
(*c*) same (*d*) none of these

852. What is the impact on flow and head when the impeller of a pump is trimmed?
(*a*) Flow decreases & pump head increases
(*b*) Flow increases & pump head decreases
(*c*) Both flow & pump head increases
(*d*) Both flow & pump head decreases

853. A centrifugal water pump is delivering 200 m^3/hr at ambient conditions. If the impeller diameter is trimmed by 10%, the water flow at the changed condition will be ..... m^3/hr.
(*a*) 120 (*b*) 140
(*c*) 160 (*d*) 180

854. The flow rate of a reciprocating air compressor can be decreased by
(*a*) decreasing speed
(*b*) outlet throttling
(*c*) inlet throttling
(*d*) all 'a', 'b' & 'c'

855. Which of the following delivers a pulsating output?
(*a*) Roots blower
(*b*) Centrifugal compressor
(*c*) Screw compressor
(*d*) Reciprocating compressor

856. Use of hard water for intercooler of a two stage reciprocating air compressor will
(*a*) reduce air inlet temperature to second stage
(*b*) increase pressure drop in water side
(*c*) reduce work done for compression
(*d*) decrease compressor speed

857. An air dryer in a compressed air system
(*a*) reduces dew point of air
(*b*) reduces work of compression
(*c*) increases dew point of air
(*d*) none of these

858. Partially closing the outlet damper in fan system will
(*a*) reduce fan static pressure
(*b*) reduce flow
(*c*) increase power consumption
(*d*) all 'a', 'b', & 'c'

859. Which of the following flow controls in the fan system will change the system resistance curve?
(*a*) Discharge damper
(*b*) Speed change with variable frequency drive
(*c*) Inlet guide vane
(*d*) Speed change with hydraulic coupling

860. Parallel operation of two identical fans in a ducted system will
(*a*) double the flow
(*b*) increase flow by more than two times
(*c*) not double the flow
(*d*) double the fan static pressure

861. A fan handling air in a ducted system is an example of ..... head.
(*a*) pure static (*b*) pure friction
(*c*) combination of static & friction
(*d*) none of these

862. In a centrifugal pump, the velocity energy is converted into pressure energy by
(*a*) suction duct (*b*) discharge duct
(*c*) impeller (*d*) volute

863. A pitot tube measures the ..... of the fluid
(*a*) flow (*b*) static pressure
(*c*) velocity
(*d*) difference between total & static pressure

864. The hydraulic power in a pumping system depends on the ..... efficiency.
(*a*) motor (*b*) pump
(*c*) both 'a' & 'b' (*d*) neither 'a' nor 'b'

865. The friction loss in a pipe carrying a fluid is proportional to the
(*a*) fluid velocity
(*b*) fifth power of the pipe diameter
(*c*) fluid flow
(*d*) square of the pipe diameter

866. The efficiency of a pump does not depend upon the
(*a*) discharge head (*b*) suction head
(*c*) motor efficiency
(*d*) fluid density

867. Net positive suction head (NPSH) available depends upon the
(*a*) discharge head (*b*) inlet pipe diameter
(*c*) power drawn (*d*) pump type

868. When the flow rate increases, NPSH
(*a*) required increases
(*b*) available increases
(*c*) required decreases
(*d*) available & required both increases

869. Which of the following fans is the most suitable for using in induced draft cooling tower?
(*a*) Centrifugal fan with FRP blades
(*b*) Centrifugal fan with aluminium blades
(*c*) Axial fan with mild steel blades
(*d*) Axial fan with aluminium blades

870. FRP fans consume less energy than aluminium fans because they
(*a*) have better efficiency
(*b*) are lighter
(*c*) have less system resistance
(*d*) deliver less air flow

871. The specific ratio as defined by ASME and used in differentiating fans, blowers and compressors, is given by
(*a*) P_s / P_d (*b*) P_d / P_s
(*c*) $P_s / (P_s + P_d)$ (*d*) $P_d / (P_s + P_d)$

where, P_s & P_d are suction & discharge pressure respectively.

872. Reducing the fan rpm by 20% decreases the fan power requirement approximately by .....%
(*a*) 24.2 (*b*) 48.8
(*c*) 58.8 (*d*) 62.4

873. Which of the following is not suitable for obtaining a pressure of 3Kg/cm^2 (bar)?
(*a*) Lobe compressor
(*b*) Centrifugal compressor
(*c*) Single stage reciprocating compressor
(*d*) Multistage reciprocating compressor

874. The characteristic of a positive displacement compressor for a given speed is that the ..... remains constant.
(*a*) compression ratio
(*b*) flow output
(*c*) temperature (*d*) pressure

875. The flow output of which of the following changes with pressure ?
(*a*) Lobe compressor
(*b*) Centrifugal compressor
(*c*) Screw compressor
(*d*) Reciprocating compressor

876. The loading and unloading of a reciprocating compressor is carried out based on
(*a*) pressure (*b*) volume
(*c*) temperature (*d*) moisture content

877. The pressure developed by a centrifugal fan depends upon the
(*a*) tip angle (*b*) blade width
(*c*) hub to tip ratio (*d*) all '*a*', '*b*' & '*c*'

878. The fan characteristic curve is a plot of ..... pressure Vs flow
(*a*) static (*b*) dynamic
(*c*) total (*d*) suction

879. Which of the following fans are suitable for handling dust laden and high temperature gases?
(*a*) Forward curved (*b*) Backward curved
(*c*) Propeller (*d*) Radial

880. In series operation of identical fans
(*a*) static pressure doubles
(*b*) static pressure goes up by four times
(*c*) flow doubles
(*d*) flow goes up by four times

881. In a centrifugal pump, the velocity energy is converted into pressure by
(*a*) casing (*b*) impeller
(*c*) diffuser (*d*) throttle valve

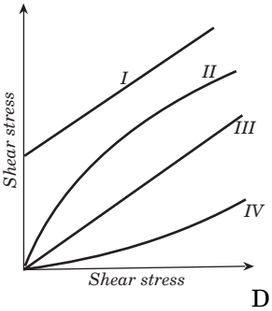
882. Bernoulli's equation for steady frictionless flow states that, along a streamline
(*a*) total pressure is constant
(*b*) total mechanical energy is constant
(*c*) velocity head is constant
(*d*) none of the above [GATE 1990]

883. A plant has a water tank mounted on the pop of a 27 meter platform. The tank is 10 m high. The height of the water in the tank, if a pressure gauge on the second floor at a height of 5 meters from the ground reads 2.7 bar is
(*a*) full (*b*) 5.12 m
(*c*) 3.12 m (*d*) 7.18 m
[GATE 1991]

884. For a centrifugal pump, the positive suction head is defined as
(*a*) $h_{vs} + h_{ps}$ (*b*) $h_{vd} + h_{pd}$
(*c*) $h_{vs} + h_{ps} = P_s$ (*d*) $h_{vd} + h_{pd} = P_d$

where,
h_{vs} = velocity head at suction
h_{vd} = velocity head at discharge
h_{ps} = pressure head at suction
h_{pd} = pressure head at discharge
p_s = vapour pressure of liquid at suction temperature
p_d = vapour pressure of liquid at discharge temperature [GATE 1993]

885. Match the following:
The shear stress *vs* velocity gradient characteristics is shown below in figure:



I. A (Newtonion)
II. B (Dilatent)
III. C (Bingham plastic)
IV. D (Pseudoplastic)

(*a*) I-C, II-D, III-A, IV-B
(*b*) I-C, II-D, III-B, IV-A
(*c*) I-A, II-B, III-C, IV-D
(*d*) I-D, II-C, III-B, IV-A [GATE 1993]

886. Match the following types of fluid (in group I) with their respective constitutive relations (in group II), where τ is the stress and γ is the strain rate.
Group I
P. Pseudoplastic Q. Bingham plastic
Group II
I. $\tau = \mu\gamma$
II. $\tau = \tau_0 + K\gamma$
III. $\tau = K\,|\gamma|^n$, $n < 1$
IIV. $\tau = K\,|\gamma|^n$, $n > 1$
(*a*) P-I, Q-IV (*b*) P-IV, Q-4I
(*c*) P-II, Q-III (*d*) P-III, Q-3II
[GATE 2005]

887. A dam of width 50 m is used to hold water in a reservoir. If the water height is 10 m from the bottom of the dam, what is the total force F acting on the dam due to the water? Assume, g = 10 m/sec^2 *and the fluid density is* 1000 kg/m^3.
(*a*) $F = 12.5 \times 10^6$N (*b*) $F = 25 \times 10^6$N
(*c*) $F = 50 \times 10^6$ N (*d*) $F = 5 \times 10^6$ N
[GATE 2005]

888. The relation between the stress τ and strain rate (du_x/dy) for the rapid flow of a granular material is given by, $\tau = B\left(\frac{du_x}{dy}\right)^2$, where B is a constant. If M, L and T are the mass, length and time dimension respectively, what is the dimension of the constant B ?
(*a*) $ML^{-1}T^{-1}$ (*b*) $ML^{-1}T^{-2}$
(*c*) MT^{-1} (*d*) ML^{-1}
[GATE 2005]

889. Match the following for a centrifugal pump with speed 'n'.
P. Capacity Q. Head
1. proportional to n
2. proportional to n^2
3. proportional to n^3
(*a*) P-2, Q-1 (*b*) P-1, Q-3
(*c*) P-2, Q-3 (*d*) P-Q, Q-2
[GATE 2006]

890. The magnitude of the force (in N) required to hold a body of volume 0.05 m^3 and mass 40 kg in water (density 1000 kg/m^3) at a depth of 0.1 m is (g = 9.81 m/sec^2)

(a) Zero (b) 98.1
(c) 490.5 (d) 882.9 [GATE 2006]

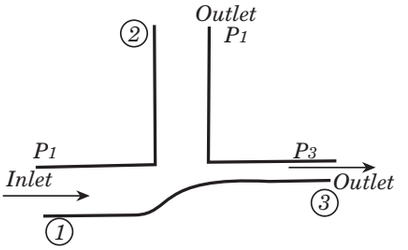
891. A liquid is pumped at the flow rate Q through a pipe of length 'L' the pressure drop of the fluid across the pipe is ΔP. Now a leak develop at the mid-point of the length of the pipe and the fluid leaks at the rate of $Q/2$. Assuming that the friction factor in pipe remains unchanged, the new pressure drop across the pipe for the same inlet flow rate (Q) will be

(a) (½) ΔP (b) (⅝) ΔP
(c) (¾) ΔP (d) ΔP [GATE 2006]

892. In a laminar flow through a pipe of radius R, the fraction of the total fluid flowing through a circular cross-section of radius R/2 centered at the pipe axis is

(a) 3/8 (b) 7/16
(c) 1/2 (d) 3/4 [GATE 2006]

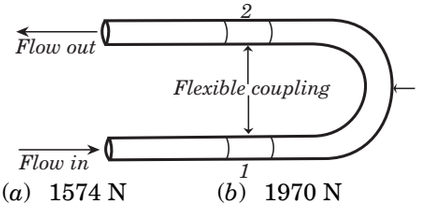
893. A pipeline system carries crude oil of density 800 kg/m^3. The volumetric flow rate at point 1 is 0.28 m^3/sec. The cross-sectional areas of branches 1,2 and 3 are 0.012, 0.008 and 0.004 m^2 respectively. All the three branches are in horizontal plane and the friction is negligible. If the pressures at point 1 and 3 are 270 kPa and 240 kPa respectively, then the pressure at point 2 is



(a) 202 kPa (b) 240 kPa
(c) 284 kPa (d) 355 kPa

[GATE 2007]

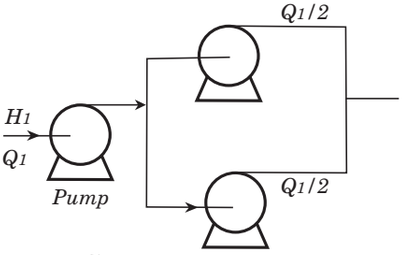
894. The figure shows the idealised view of a return elbow or U-bend, which is connected to two pipes by flexible hoses that transmit no force. Water with density 1000 kg/m^3 flows at velocity of 10 m/s through the pipe, which has uniform ID of 0.1 m. The gauge pressures at point 1 and 2 are 304 kPa and 253 kPa respectively. The horizontal force F required to keep the elbow in position is



(a) 1574 N (b) 1970 N
(c) 5942 N (d) 7533 N

[GATE 2007]

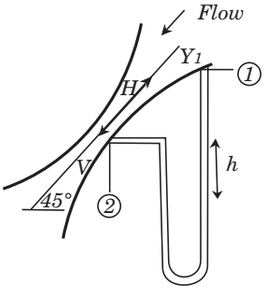
895. The figure shows a series-parallel configuration of three identical centrifugal pumps. The head increase ΔH across a single such pump varies with flow rate Q according to $\Delta H = a - bQ^2$. The expression for the total head increase $\Delta H = \Delta H_2 - \Delta H_1$ in terms of a and b and the total flow rate Q_1 for this configuration is given by



(a) $2a - \frac{5}{4}bQ_1^2$ (b) $2a - bQ_1^2$
(c) $2a - 2bQ_1^2$ (d) $a - bQ_1^2$

[GATE 2007]

896. The differential across a venturimeter inclined at 45° to the vertical (as shown in the figure) is measured with the help of a



manometer to estimate the flow rate of a fluid flowing through it. If the density of the flowing fluid is ρ and the density of the manometer fluid is ρ_m, the velocity of the fluid at the throat can be obtained from the expression

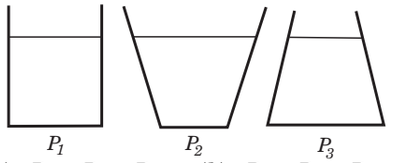
(*a*) $\frac{V_2^2 - V_1^2}{2g} = \frac{h(\rho_m - \rho)}{\rho} + H \sin 45°$

(*b*) $\frac{V_2^2 - V_1^2}{2g} = \frac{h\rho_m}{h} + H \sin 45°$

(*c*) $\frac{V_2^2 - V_1^2}{2g} = \frac{h\ \rho_m}{\rho}$

(*d*) $\frac{V_2^2 - V_1^2}{2g} = \frac{h(\rho_m - \rho)}{\rho}$ [GATE 2007]

897. Three containers are filled with water upto the same height as shown. The pressures at the bottom of the containers are denoted by P_1,P_2 and P_3. Which of the following relations is true?



(*a*) $P_3 > P_1 > P_2$ (*b*) $P_2 > P_1 > P_3$

(*c*) $P_1 > P_2 = P_3$ (*d*) $P_1 = P_2 = P_3$

898. Losses for flow through valves and fittings are expressed in terms of

(*a*) drag coefficient

(*b*) equivalent length of a straight pipe

(*c*) shape factor

(*d*) roughness factor [GATE 2008]

899. Given a pipe diameter D, the entrance length necessary to achieve fully developed laminar flow is proportional to (N_{Re} is Reynold's number)

(*a*) DN_{Re} (*b*) $\frac{D}{N_{Re}}$

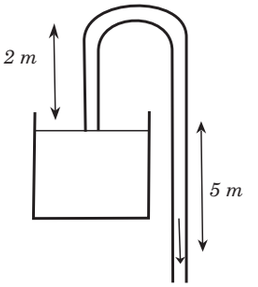
(*c*) DN_{Re}^2 (*d*) $\frac{D}{N_{Re}^2}$ [GATE 2008]

900. A pump draws oil (specific gravity 0.8) from a storage tank and discharges it to an overhead tank. The mechanical energy delivered by the pump to the fluid is 50 J/kg. The velocities at the suction and discharge points of the pumps are 1 m/s and 7 m/s respectively. Neglecting friction losses and assuming kinetic energy correction factor to be unity. The pressure developed by the pump (in kN/m^2)is

(*a*) 19.2 (*b*) 20.8

(*c*) 40 (*d*) 80 [GATE 2008]

901. The siphon tube having a diameter of 2 cm draws water from a large open reservoir and discharges into the open atmosphere as shown in the figure. Assume incompressible fluid and neglect losses (g = 9.8 m/s^2). The velocity (in m/s) at the discharge point is



(*a*) 9.9 (*b*) 11.7

(*c*) 98 (*d*) 136.9

[GATE 2008]

902. In Q.No. 901, the volumetric flow rate (in L/S) of water at the discharge is

(*a*) 3.11 (*b*) 3.67

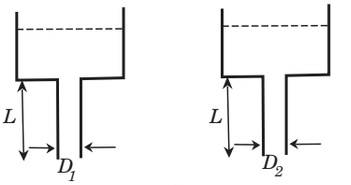
(*c*) 30.77 (*d*) 42.99 [GATE 2008]

903. Under fully turbulent flow conditions, the frictional pressure drop across a packed bed varies with the superficial velocity (V) of the fluid as

(*a*) V^{-1} (*b*) V

(*c*) $V^{3/2}$ (*d*) V^2 [GATE 2009]

904. Two identical reservoirs opened at the top are drained through pipes attached to the bottom of the tanks as shown below. The two drain pipes are of the same length, but of different diameters ($D_1 > D_2$). Assuming the flow to be steady and laminar in both drain pipes, if the volumetric flow rates in the larger pipe is 16 times of that in the smaller pipe, the ratio D_1/D_2 is

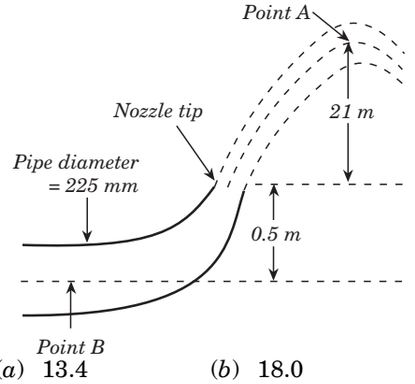


(*a*) 2 (*b*) 4

(*c*) 8 (*d*) 16 [GATE 2009]

905. Afree jet of water is emerging from a nozzle (of diameter 75 mm) attached to a pipe (of diameter 225 mm) as shown below:
The velocity of water at point A is 18 m/s.

Neglect friction in the pipe and nozzle. (Using, $g = 9.81$ m/sec^2 and density of water = 1000 kg/m^3)
The velocity of water at the tip of the nozzle is (in m/sec)



(*a*) 13.4 (*b*) 18.0
(*c*) 23.2 (*d*) 27.1 [GATE 2009]

906. In Q.No.905, the gauge pressure (in kPa) at point B is
(*a*) 80.0 (*b*) 100.0
(*c*) 239.3 (*d*) 367.6 [GATE 2009]

907. Pressure is a
(*a*) vector (*b*) scalar
(*c*) tensor (*d*) none of these

908. A fluid in equililbrium means that
(*a*) its viscosity is zero
(*b*) shear stresses are acting on the fluid but no flow behaviour is manifested
(*c*) it is free from shear stresses
(*d*) a hypothetical situation because fluids are never in equilibrium

909. Two tubes of diameters, 1and 2 cms are filled with mercury to a height of 50 cms. Pressure at the bottom of the mercury coloumn will be
(*a*) higher for the tube of dia 1 cm
(*b*) higher for the tube of dia 2 cm
(*c*) the same for both the tubes
(*d*) none of these

910. A manometer is used to measure
(*a*) pressure difference
(*b*) absolute pressure
(*c*) both (*a*) and (*b*)
(*d*) neither (*a*) nor (*b*)

911. The flow of an incompressible fluid with no shear is known as ..... flow.
(*a*) potential (*b*) laminar
(*c*) turbulent (*d*) couette

912. A fluid is called Newtonion when the shear stress Vs shear strain plot is
(*a*) linear and passes through origin
(*b*) linear but has an intercept
(*c*) exponential and passes through the origin
(*d*) is a rectangular hyperbola

913. When a fluid flows over a stationary solid surface, the fluid velocity at the fluid-solid interface is
(*a*) zero
(*b*) equal to free-stream velocity
(*c*) between zero and free-stream velocity
(*d*) none of these

914. Liquid that does not flow at all until a threshold shear stress is attained is know as
(*a*) Bingham plastic (*b*) Pseudoplastic
(*c*) Dilatant fluid (*d*) Newtonion liquid

915. Kinematic viscosity (which has a unit of m^2/sec) is a ratio of
(*a*) absolute viscosity to absolute pressure
(*b*) absolute viscosity to absolute temperature
(*c*) absolute viscosity to specific heat
(*d*) none of these

916. The onset of turbulence is characterised by
(*a*) a sudden rapid decrease in the thickness of the boundary layer
(*b*) a sudden increase in velocity in the direction of flow
(*c*) a sudden rapid increase in the thickness of the boundary layer
(*d*) a sudden decrease in velocity in the direction of flow

917. A turbulent boundary layer consists of three zones which are buffer layer, turbulent zone and
(*a*) critical layer (*b*) stagnant zone
(*c*) viscous sub layer
(*d*) thin film zone

918. Continuity equation applies to
(*a*) incompressible fluids
(*b*) compressible fluids
(*c*) highly viscous fluids
(*d*) both incompressible and compressible fluids

919. Which of the following is correct for flow of an incompressible fluid (of density 'r') at a flow rate of Q (volume/time) through a tube of constant cross-sectional area A?
(a) Q/A = constant
(b) $Q.r$ = constant
(c) $Q.r/A$ = constant
(d) all (a), (b) & (c)

920. Unit of mass velocity in S.I unit is
(a) kg/s (b) kg/m^3 . s
(c) kg/m.s (d) kg /m^2 . s

921. For flow of incompressible fluid through tubes of constant cross-sectional area, mass velocity is
(a) directly proportional to the absolute temperature
(b) inversely proportional to the total pressure
(c) directly proportional to the absolute temperature
(d) independent of temperature and pressure

922. For fully developed velocity profile for laminar flow
(a) parabolic with the apex at the centerline of the pipe
(b) parabolic with the apex at the pipe wall
(c) rod-like
(d) none of these

923. A settling particle attains its terminal velocity when
(a) gravity force + drag force = buoyancy force
(b) gravity force – drag force = buoyancy force
(c) buoyancy force = gravity force
(d) drag force = buoyancy force

924. For fully developed steady flow of a viscous fluid at constant density through a horizontal pipe, relation between wall shear stress (t_w) and shear stress (t) at any radial position of the pipe is given by
(a) $[t/t_w] = [r/R]$ (b) $[t/t_w]=[R/r]$
(c) $[t/t_{w]} = [1 - [r/R]^2$
(d) $[t/t_{w]} = [r/R]^2$

925. For laminar water flow through a tube of diameter 1 cm, the average (U_{avg}) & maximum (U_{max}) water velocity are related as
(a) $u_{max} = 1.5u_{av}$ (b) $u_{max} = 2u_{av}$
(c) $u_{max} = 2.5u_{av}$ (d) $u_{max} = 3u_{av}$

926. For an ideal fluid flow, the Reynold's number is
(a) 2100 (b) 4000
(c) 0 (d) ∞

927. For turbulent fluid flows through pipes, the kinetic energy & momentum correction factors are practically equal to
(a) 0.5 (b) 1
(c) 2 (d) 4

928. Velocity gradient at the centre line for turbulent water flow through a smooth pipe is
(a) infinity (b) zero
(c) between zero and one
(d) none of these

929. The logarithmic velocity law for the turbulent core was proposed by
(a) Reynold's (b) Nikuradse
(c) Von Karman (d) Prandtl

930. Two spherical particles of diameters d_1&d_2 settle freely through a pool of liquid in Stokes law range. if d_1:d_2 = 1:2, then their settling velocities ratio u_1:u_2 will be equal to
(a) 1:2 (b) 2:1
(c) 4:1 (d) 1:4

931. For free settling in intermediate range, terminal velocity of a particle varies as
(a) dp (b) $dp^{0.5}$
(c) dp^2 (d) $dp^{1.14}$
where, dp = particle diameter

932. Brownian movement predominates over the gravity force for particle of size ..... mm.
(a) 100 (b) 10
(c) 0.1 (d) none of these

933. In potential flow, wall drag is
(a) infinite (b) zero
(c) finite and non-zero
(d) none of these

934. At the stagnation point
(a) pressure is zero
(b) both pressure and velocity are zero
(c) velocity is zero
(d) neither pressure nor velocity is zero.

935. The terminal velocity of a sphere settling freely through a pool of liquid in Stoke's law range will ..... the liquid viscosity
(*a*) be independent of
(*b*) increase linearly with
(*c*) decrease inversely with
(*d*) decrease inversely with the square of

936. If the terminal settling velocities of spheres of different sizes (settling freely through a pool of liquid) increases with the square root of particle diameter, then the settling conforms to the ..... regime.
(*a*) Stokes' law range
(*b*) intermediate
(*c*) Newton's law
(*d*) any one of the above, more data needed for correct prediction.

937. For free settling of spherical particles in accordance with Newton's law, the drag co-efficient is
(*a*) constant
(*b*) directly proportional to the particle Reynold's number
(*c*) inversely proportional to the particle Reynold's number
(*d*) inversely proportional to the 0.6 power of the particle Reynold's number

938. A fluidised bed is formed when the
(*a*) fluid friction is zero
(*b*) gravity force is less than fluid friction
(*c*) pressure force is equal but acts in opposite direction to the gravity force
(*d*) sum of fluid friction & pressure force is equal but opposite to gravity force

939. For steady isentropic flow of a compressible fluid through a convergent-divergent nozzle, sonic conditions can occur
(*a*) only at the throat
(*b*) anywhere between the inlet of the converging section and the throat
(*c*) anywhere between the throat and the outlet of the diverging section
(*d*) only at the outlet of the diverging section.

940. Consider the compressible fluid flow through a convergent-divergent nozzle. If the process taking place in the divergent section of the nozzle is an isentropic expansion, then the stagnation temperature for this case is
(*a*) is constant
(*b*) changes linearly in the direction of flow
(*c*) is maximum at the throat
(*d*) is minimum at the throat.

941. Consider the compressible fluid flow through a convergent-divergent nozzle. The conditions and flow rates are such that Mach number is unity at the throat. The flow in the divergent section
(*a*) is sonic
(*b*) is definitely subsonic
(*c*) is definitely supersonic
(*d*) may be subsonic or supersonic, depending on the pressure in the downstream side.

942. Which of the following statements is are correct about valves?
(*a*) Gate valves are so designed as to cause fluids to change in direction of flow of fluids
(*b*) Globe valves do not cause any change in direction of flow of fluids
(*c*) Under otherwise uniform conditions, pressure drop in a gate valve is larger than that in a globe valve
(*d*) None of the above statements is correct.

943. In a certain process, one needs fluid flow in a given direction and the valve is to open or close by the fluid pressure. Which of the following valve permits fluid flow in one direction only?
(*a*) Gate valve (*b*) Globe valve
(*c*) Check valve (*d*) Any of the above.

944. Safety valve is basically a
(*a*) gate valve (*b*) globe valve
(*c*) check valve (*d*) none of these

945. The maximum discharge pressure for commercial piston pump is around ..... atmosphere.
(*a*) 10 (*b*) 50
(*c*) 200 (*d*) 500

946. Mechanical efficiency for large piston pump varies from ..... per cent
(*a*) 10 to 20 (*b*) 40 to 50
(*c*) 70 to 90 (*d*) 97 to 99

947. As the discharge pressure increases, the volumetric efficiency of a positive displacement pump
(*a*) decreases
(*b*) remain practically constant

(*c*) increases
(*d*) may decrease or increase, depending on the size of the pump.

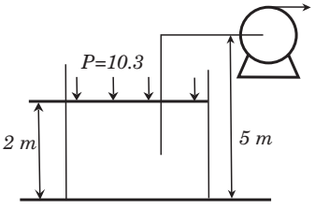
948. Which of the following is/are example (s) of rotary positive displacement pumps?
(*a*) Gear pump (*b*) Vane pump
(*c*) Screw pump (*d*) all (*a*), (*b*) & (*c*)

949. The Grashoff number is
(*a*) thermal diffusivity / mass diffusivity
(*b*) inertial force / surface tension force
(*c*) sensible heat / latent heat
(*d*) buoyancy force / viscous force.
[GATE 2007]

950. Match the following:
P. Euler number
Q. Froude number
R. Weber number
1. viscous force/inertial force
2. pressure force/inertial force
3. inertial force/gravitational force
4. inertial force/surface tension force
(*a*) P-1, Q-2, R-3 (*b*) P-2, Q-3, R-4
(*c*) P-3, Q-2, R-1 (*d*) P-4, Q-3, R-2
[GATE 2008]

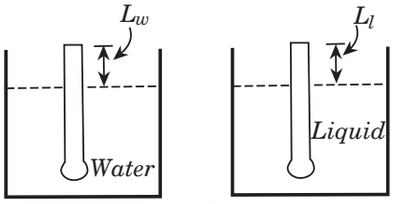
951. The prandtl number of a fluid is the ratio of
(*a*) thermal diffusivity to momentum diffusivity
(*b*) momentum diffusivity to thermal diffusivity
(*c*) conductive resistance to convective resistance
(*d*) thermal diffusivity to kinematic diffusivity. [GATE 2009]

952. A storage vessel exposed to atmosphere (absolute pressure = 10.3 m of water) has a diameter of 3 m and is initially filled with water to a height of 2 m. The pump draws water from the vessel and is located at an elevation of 5 m above the bottom of the vessel. The frictional head loss in the suction pipe is 2 m of water. If the vapour pressure of the liquid at the temperature of operation is 3 m of water, Then the available NPSH is
(*a*) 2.3 m
(*b*) 5.3 m
(*c*) 6.3 m
(*d*) 8.3 m
[GATE 2010]



953. In Hagen Poisseule flow through a cylindrical tube, The radial profile of shear stress is
(*a*) constant (*b*) cubic
(*c*) parabolic (*d*) linear [GATE 2010]

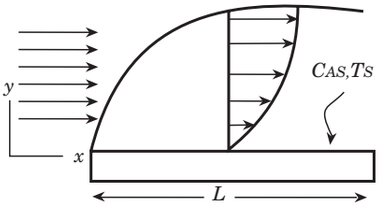
954. A hydrometer with stem cross-sectional area of $2.82 \times 10^{-5}\ m^2$ is immersed in a very large vessel containing water as shown in the figure. The immersed volume is $15 \times 10^{-6}\ m^3$ and the length of the stem about water surface is L_w. If the entire volume of water is replaced by a liquid with specific gravity 1.5 and if the length of the stem above liquid surface is L_l, then the difference, $L_l - L_w$, is



(*a*) –177 mm (*b*) 177 mm
(*c*) –266 mm (*d*) 266 mm
[GATE 2010]

955. The diameter of a drop of a liquid fuel changes with time, due to combustion, according to the relationship, $D = D_o(1 - \frac{t}{t_b})$, While burning, the drop falls at its terminal velocity under Stoke's flow regime. The distance it will travel before complete combustion, is given by
(*a*) $\frac{D_o^2 \,.\, \Delta\rho \,.\, t_b \,.\, g}{18\mu}$ (*b*) $\frac{D_o^2 \,.\, \Delta\rho \,.\, t_b \,.\, g}{36\mu}$
(*c*) $\frac{D_o^2 \,.\, \Delta\rho \,.\, t_b \,.\, g}{54\mu}$ (*d*) $\frac{D_o^2 \,.\, \Delta\rho \,.\, t_b \,.\, g}{108\mu}$.
[GATE 2010]

956. A liquid flows over a flat naphthalene plate of length L, at a Reynold's number $R_{eL} = L\ \rho\ U_\infty/\mu$)of 1500 as shown in the figure. The surface concentration of naphthalene is $CA_s > CA_\infty$, and the surface temperature is, $T_s > T\infty$. Assume $P_r = S_c = 1$
If, at
$x = L$, $\frac{\partial C_A^*}{\partial_y^*}\Big|_{y^* = 0} = 10$; where, $C_A^* = \frac{C_A - C_{AS}}{C_{A\infty} - C_{AS}}$,



and, $y^* = y/L$, then the Nusselt number and the friction co-efficient at, x = L, are

(*a*) 10, 1/75 (*b*) 10, 10
(*c*) 20, 10 (*d*) 1 / 75, 5

[GATE 2010]

957. The magnus effect is defined as the
(*a*) generation of lift per unit drag force.
(*b*) circulation induced in an aircraft wing
(*c*) separation of boundary layer near the trailing edge of a slender body
(*d*) generation of lift on a rotating cylinder in a uniform flow.

958. For an irrational flow, the velocity potential lines and the streamlines are always
(*a*) parallel to each other
(*b*) coplaner
(*c*) orthogonal to each other
(*d*) inclinded to the horizontal

959. A hydraulic jump occurs in a channel
(*a*) whenever the flow is supereritical
(*b*) if the flow is controlled by a sluice gate
(*c*) if the bed slope changes from mild to steep
(*d*) if the bed slope changes from steep to mild

960. Flow separation is caused by
(*a*) reduction of pressure to local vapor pressure
(*b*) a negative pressure gradient
(*c*) a positive pressure gradient
(*d*) thinning of boundary layer thickness to zero

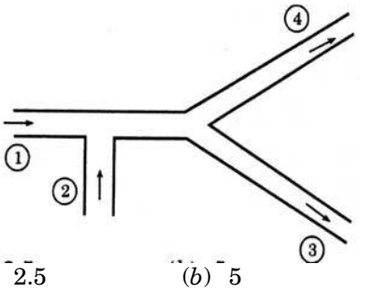
961. Shear stress in a turbulent flow is due to the
(*a*) viscous property of the fluid
(*b*) fluid density
(*c*) fluctuation of velocity in the direction
(*d*) fluctuation of velocity in the direction of flow as well as transverse to it.

962. A pipe flow system with flow direction is shown in the given Fig.

The following tables gives the velocities and the corresponding areas:

Pipe	No. Area. cm^2	Velocity.cm see
1	50	10
2	50	V
3	80	5
4	70	5

The value of 'V' in cm/sec. is



(*a*) 2.5 (*b*) 5
(*c*) 7.5 (*d*) 10

963. The prime parameter causing change of state in a Fanno flow is
(*a*) heat transfer (*b*) area change
(*c*) friction (*d*) buoyancy

964. In a normal shock in a gas, the
(*a*) upstream flow is superonic
(*b*) upstream flow is subsonic
(*c*) downstream flow is sonic
(*d*) both downstream flow and upstream flow are supersonic

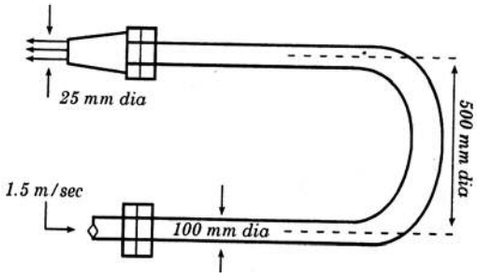
965. In isentropic flow between two points, the stagnation
(*a*) pressure and stagnation temperature may vary.
(*b*) pressure would decrease in the direction of the flow.
(*c*) pressure and stagnation temperature would decrease with an increase in velocity
(*d*) pressure, stagnation temperature and stagnation density would remain constant throughout the flow.

966. At the eye tip of centrifugal impeller, blade velocity is 200 m/sec, while the uniform axial velocity at the inlet is 150 m/sec. If the sonic velocity is 300 m/sec, then the inlet Mach number of the flow will be
(*a*) 0.50 (*b*) 0.66
(*c*) 0.83 (*d*) 0.87

967. Consider the following statements regarding the specific speed of a centrifugal pump:
1. Specific speed is defined as the speed of a geometrically similar pump developing unit power under unit head.
2. At the same specific speed, the efficiency is greater with larger capacity.
3. The specific speed increases with the increase in outer blade angle.
4. The specific speed various directly as the square root of the pump discharge of the statements:
(*a*) 1 and 2 are correct
(*b*) 2 and 4 are correct
(*c*) 3 and 4 are correct
(*d*) 2 and 3 are correct

968. A bucket of water hangs with a spring balance. If an iron piece is suspended into water from another support without touching the sides of the bucket, the spring balance will show
(*a*) an increased reading
(*b*) a decreased reading
(*c*) no change in reading
(*d*) increased or decreased reading depending upon the depth of immersion.

969. The elbow nozzle assembly shown in the given Fig. below in a horizontal plane. The velocity of the jet issuing from the nozzle is ..... m/s.



(*a*) 4 (*b*) 16
(*c*) 24 (*d*) 30

970. The correct sequence is ascending order of the magnitude of the given parameter is:
(*a*) Boundary layer thickness, momentum thickness, displacement thickness.
(*b*) Displacement thickness, boundary layer thickness, momentum thickness.
(*c*) Momentum thickness, displacement thickness, boundary layer thickness.
(*d*) Momentum thickness, boundary layer thickness, displacement thickness.

971. A 1 : 256 scale model of a reservoir is drained in 4 minutes by opening of sluice gate. The time required to empty the protype will be ..... minute.
(*a*) 128 (*b*) 64
(*c*) 32 (*d*) 25.4

972. If the full scale turbine is required to work under a heat of 30 m and to run at 428 rpm, then a quarter scale turbine model tested under a head of 1 m must run at ..... rpm.
(*a*) 143 (*b*) 341
(*c*) 428 (*d*) 988

973. Which one of the following sets of standard flows is superimposed to represent the flow around a rotating cylinder?
(*a*) Doublet, vortex and uniform flow
(*b*) Source, vortex and uniform flow
(*c*) Sink, vortex and uniform flow.
(*d*) Vortex and uniform flow.

974. The height of a cylindrical container that of its diameter. The ratio of the horizontal forces on the wall of the cylinder, when it is completely filled to that when it is half filled with the same liquid is:
(*a*) 2 (*b*) 3
(*c*) 3.5 (*d*) 4

975. The pipe is connected in series to another pipe whose diameter is twice and length is 32 times that of the first pipe. The ratio of frictional head losses for the first to those for the second pipe is (both the pipes have same fricitional constant)
(*a*) 8 (*b*) 4
(*c*) 2 (*d*) 1

976. Which one of the following statements is correct?
(*a*) Hydraulic grade line and energy grade line are the same influid flow problems.
(*b*) Energy grade line lies above the hydraulic grade line and is always parallel to it.
(*c*) Energy grade line lies above the hydraulic grade line and they are separated from each other by a vertical distance equal to velocity head.
(*d*) The hydraulic grade line slopes upwards meeting the energy grade line only at the exit of flow.

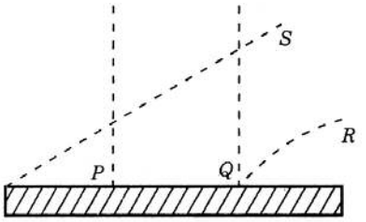
977. A pipeline connecting two reservoirs has its diameter reduced by 20% due to the deposition of chemicals. For a given head difference in the reservoirs with unaltered friction factor, this would cause a reduction in discharge of ..... %.

(*a*) 42.8 (*b*) 20
(*c*) 17.8 (*d*) 10.6

978. A tank containing water has two orifices of the same size at depths of 40 cms and 90cm below the free surface of water. The ratio of discharge through those orifices is

(*a*) 1 : 1 (*b*) 2 : 3
(*c*) 4 : 9 (*d*) 16:81

979. The development of boundary layer zones labeled, P, Q, R, S over a flat plate is shown in the figures.



Based on the Fig. match list I (Boundary layer zones) with list II (Types of boundary layer) and select the correct answer using the codes given below the lists:

List I	***List II***
A. *P*	1. Transistioal
B. *Q*	2. Laminar viscous sub-layer
C. *R*	3. Laminar
D. *S*	4. Turbulent

Codes:

	A	B	C	D
(*a*)	3	1	2	4
(*b*)	3	2	1	4
(*c*)	4	2	1	3
(*d*)	4	1	2	3

980. When pressure drag over a body is large as compared to the friction drag, then the shape of the body is that of

(*a*) an aerofoil (*b*) a streamlined body
(*c*) a two dimensional body
(*d*) a bluff a body

981. The gross head available to a hydraulic power plant is 100 m. The utilised head in the runner of the hydraulic turbine is 72 m. If the hydraulic efficiency of the turbine is 90%, the pipe friction head is estimated to be ..... m.

(*a*) 20 (*b*) 18
(*c*) 16.2 (*d*) 1.8

982. A rectangular tank of square cross-section is having its height equal to twice the length of any side at the base. If the tank is filled up with a liquid, the ration of the total hydrastatic force on any vertical wall to that at bottom is

(*a*) 2.0 (*b*) 1.5
(*c*) 1.0 (*d*) 0.5

983. For a maximum transmission of power through a pipeline with total head '*H*', the head loss due to friction h_f, is given by:

(*a*) 0.1 *H* (*b*) *H*/3
(*c*) *H*/2 (*d*) 2*H*/3

984. Laminar development flow at an average velocity of 5 m/s occurs in a pipe of 10 cm radius. The velocity at 5 cm radius is ..... m/s.

(*a*) 7.5 (*b*) 10
(*c*) 2.5 (*d*) 5

985. In a fully develop turbulent pipe flow, assuming 1/7th power law, the ratio of the mean velocity at the centre of pipe to the average velocity of the flow is

(*a*) 2.0 (*b*) 1.5
(*c*) 1.22 (*d*) 0.817

986. The pressure drop in a 100 mm diameter horizontal pipeline is 50 kPa over a length of 10 m. The shear stress at the pipe wall is ..... kPa.

(*a*) 0.25 (*b*) 0.125
(*c*) 0.50 (*d*) 25.0

987. Match list I with list II and select the correct answer using the codes given below the lists:

List I	***List II***
A. Stoke's law	1. Stouhal number
B. Bluff body	2. Creeping motion
C. Streamline body	3. Pressure drag
D. Karman Vortex	4. Skin friction drag

Codes:

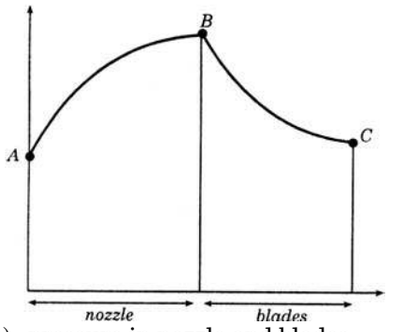
	A	B	C	D
(*a*)	2	3	1	4
(*b*)	3	2	4	1
(*c*)	2	3	4	1
(*d*)	3	2	1	4

988. A slip with hull length of 100 m is to run with a speed of 10 m/s. For dynamic similarity, the velocity for a 1:25 model of the ship in a towing tank should be .... m/s.

(*a*) 2 (*b*) 10
(*c*) 20 (*d*) 25

989. A right circular cylinder is filled with a liquid upto its top level. It is rotated about its vertical axis at such a speed that half the liquid spills out, then the pressure at the point of intersection of the axis and bottom is
(*a*) same as before rotation
(*b*) half of the value before rotation
(*c*) quarter to the value before rotation
(*d*) equal to the atmospheric pressure.

990. The given Fig. below shows the variation of certain steam parameters in case of a simple impulse turbine. The curve *A*-*B*-*C* represents the variation of



(*a*) pressure in nozzle and blades.
(*b*) velocity in nozzle and blades.
(*c*) temperature in nozzle and blades.
(*d*) enthalpy in nozzle and blades.

991. For maximum blade efficiency of single stage impulse turbine, the blade speed ratio (α is the angle made by absolute velocity at inlet) should be
(*a*) cos 2 α (*b*) cos $2\alpha/2$
(*c*) cos $\alpha/2$ (*d*) $2/\cos \alpha$

992. Consider the specific range of the following types of turbines.
1. Francis 2. Kaplan 3. Pelton
The sequence of their specific speed in increasing order is
(*a*) 1, 2, 3 (*b*) 3, 1, 2
(*c*) 3, 2, 1 (*d*) 2, 3, 1

993. Consider the following statement regrading the fluid coupling:
1. Efficiency increases with increase in speed ratio.
2. Neglecting friction, the output torque is equal to input torque.
3. At the same input speed, higher slip requires higher input torque.
Which of the statement are correct?
(*a*) 1, 2 and 3 (*b*) 1 and 2
(*c*) 2 and 3 (*d*) 1 and 3

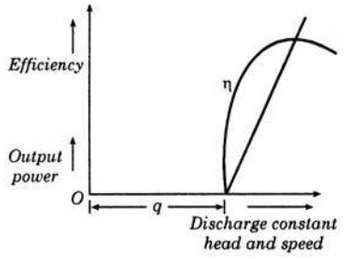
994. If a reciprocating pump having a mechanical efficiency of 80% delivers water at the rate of 80 kg/s with a head of 30 m, the brake power of the pump is ..... kW.
(*a*) 29.4 (*b*) 20.8
(*c*) 15.4 (*d*) 10.8

995. The gross head on a turbine is 300 m. The length of penstock supplying water from reservoir to the turbine is 40 m. The diameter of the penstock is 1 m and velocity of water through penstock is 5 m/s. If co-efficient of friction is 0.0098, the net head on the turbine would be nearly ..... m.
(*a*) 310 (*b*) 295
(*c*) 200 (*d*) 150

996. A hydraulic coupling transmits 1 kW of power at an input speed of 200 rpm with a slip of 2%. If the input speed is changed to 400 rpm, the power transmitted with the same slip is ..... kW.
(*a*) 2 (*b*) 0.5
(*c*) 4 (*d*) 8

997. Consider the following statements pertaining to a centrifugal pump:
1. The manometric head is the head developed by the pump.
2. The suction pipe has generally a larger diameter as compared to the discharge pipe.
3. The suction pipe is provided with a foot valve and a strainer.
4. The delivery pipe is provided with a foot valve and a strainer.
(*a*) 1, 2, 3 and 4 are correct
(*b*) 1 and 2 are correct
(*c*) 2 and 3 are correct
(*d*) 1 and 3 are correct

998. For a water turbine, running at a constant heat and speed, the operating characteristics curves in the given Fig. below show that upto a certain discharge '*q*', both output power and efficiency remain zero
The discharge '*q*' is required to?
(*a*) Overcome initial interia.
(*b*) Overcome initial friction.



(*c*) Keep the hydraulic circuit full.
(*d*) Keep the turbine running at no load.

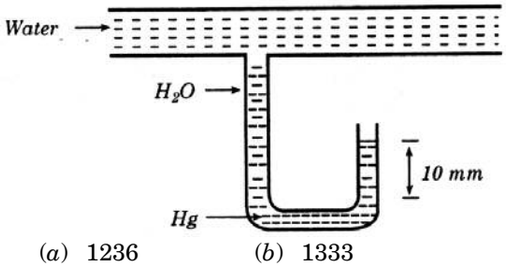
999. The maximum number of jets generally employed in an impulse turbine without jet interference is
(*a*) 4 (*b*) 6
(*c*) 8 (*d*) 12

1000. In a flow field, the stream line and equipotential lines
(*a*) are parallel
(*b*) orthogonal everywhose in the flow field
(*c*) cut at any angle
(*d*) cut orthogonally except at the stagnation points.

1001. For a fluid element in a two dimension flow field (*x*-*y* plane), it will undergo
(*a*) translation only
(*b*) translation and rotation
(*c*) translational and deformation
(*d*) deformation only

1002. The 2-D flow with velocity $\overrightarrow{V} = (x + 2y + 2)\overrightarrow{i} + (4 - y)\overrightarrow{j}$ is
(*a*) compressible and irrotational
(*b*) compressible and not irratational
(*c*) compressible and irrotational
(*d*) incompressible and irrotational

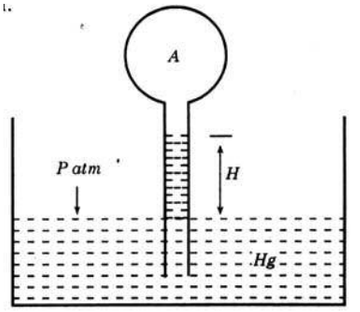
1003. A mercury manometer is used to measure the static pressure at a point in a water pipe is shown in Fig. The level difference of the mercury in the two limbs is 10 mm. The gauge pressure at that point is ..... Pa.



(*a*) 1236 (*b*) 1333
(*c*) 0 (*d*) 98

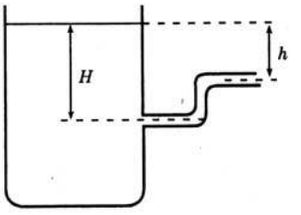
1004. For a compressible fluid, sonic velocity is
(*a*) a property of the fluid
(*b*) always given by $(YRT)^{12}$, where Y, R, T are respectively the ratio of specific heats, gas constant and temperature in K.
(*c*) always given by $(\delta_\rho/\delta_p)s^{sup1/_2}$, where p, ρ and s are respectively pressure, density and entropy.
(*d*) always greater than the velocity of fluid any location.

1005. In Fig. below if the pressure of gas in bulb *A* is 50 cm Hg vacuum and P_{atm} = 76 cm Hg, the height of column '*H*' is equal to ..... cm.



(*a*) 26 (*b*) 50
(*c*) 76 (*d*) 126

1006. The discharge velocity at the point exit in Fig. below is
(*a*) $\sqrt{2gH}$
(*b*) $\sqrt{2gh}$
(*c*) $\sqrt{2g(H + h)}$
(*d*) 0



1007. A fluid flow is represented by the velocity field, $V = ax\overrightarrow{i} + ay\overrightarrow{j}$, where 'a' is a constant. The equation of streamline passing through a point (1.2) is
(*a*) $x - 2y = 0$ (*b*) $2x + y = 0$
(*c*) $2x - y = 0$ (*d*) $x + 2y = 0$

1008. Match the following:

List I	***List II***
P. Reciprocating pump	1. Plant with power output below 100 kW.
Q. Axial flow pump	2. Plant with power output below 100 kW.

R. Microhydel plant	3. Positive displacement
S. Backward curved	4. Draft tube
	5. High flowrate, low pressure ratio
	6. Centrifugal impeller pump

(*a*) P-3, Q-5, R-6, S-2
(*b*) P-3, Q-5, R-2, S-6
(*c*) P-3, Q-5, R-1, S-6
(*d*) P-4, Q-5, R-1, S-6

1009. A fluid is represented by the velocity field, $\vec{V} = a\vec{x}i + a\vec{y}j$, where '*a*' is a constant. The equation of streamline passing through a point (1, 2) is

(*a*) $x - 2y = 0$ (*b*) $2x + y = 0$
(*c*) $2x - y = 0$ (*d*) $x + 2y = 0$

1010. An incompressible fluid (kinetic viscosity $= 7.4 \times 10^{-7}$ m^2/*s*, sp.gravity = 0.88) is held between two parallel plates. If the top plate is moved with a velocity of 0.5 m/s, while the bottom one is held stationary, the fluid attains a linear velocity profile in the gap of 0.5 mm between these plates. The shear stress in Pascal's on the surface of top plate is

(*a*) 0.651×10^{-3} (*b*) 0.651
(*c*) 6.51 (*d*) 0.651×10^{3}

1011. For a fluid flow through a divergent pipe of length '*L*' having inlet & outlet radii of R_1 & R_2 respectively and a constant flow rate of '*Q*', assuming the velocity to be axial and uniformat any cross-section, the acceleration at the exit is

(*a*) $\dfrac{2Q(R_1 - R_2)}{\pi L R^{\frac{3}{2}}}$ (*b*) $\dfrac{2Q^2(R_1 - R_2)}{\pi L R^{\frac{3}{2}}}$
(*c*) $\dfrac{2Q^2(R_1 - R_2)}{\pi^2 . L . R^{\frac{5}{2}}}$ (*d*) $\dfrac{2Q^2(R_2 - R_1)}{\pi^2 . L . R^{\frac{5}{2}}}$

1012. A closed cylinder having a radius R and height H is filled with oil of density ρ. If the cylinder is rotated about its axis at an angular velocity of w, the thrust at the bottom of the cylinder is

(*a*) $\pi R^2 \rho g H$ (*b*) $\pi R^2 \dfrac{\rho w^2 R^2}{4}$
(*c*) $\pi R^2(\rho w^2 R^2 + \rho g H)$
(*d*) $\pi R^2\left(\dfrac{\rho w^2 R^2}{4} \rho g H\right)$

1013. For air flow over a flat plate, velocity (U), and boundary layer thickness (δ) can be expressed respectively as

$$\frac{U}{U_\alpha} = \frac{3}{2} \cdot \frac{y}{\delta} - \frac{1}{2}\left(\frac{y}{\delta}\right)^3 ; \delta \frac{4.64x}{\sqrt{R_{ex}}}$$

If the free stream velocity is 2 m/s and air has kinematic viscosity of 1.5×10^{-5} m^2/*s* and density of 1.23 kg/m^3, the wall shear stress at x = 1 m is ..... N/m^2.

(*a*) 2.36×10^{2} (*b*) 4.36×10^{-3}
(*c*) 4.36×10^{-3} (*d*) 2.18×10^{-3}

1014. A centrifugal pump is required to pump water to an open water tank situated 4 km away from the location of the pump through a pipe of diameter 0.2 m having Darcey's friction factor of 0.01. The average speed of water in the pipe of 2 m/s. It is to maintain a constant head of 5 m in the tank, neglecting other minor losses, the absolute discharge pressure at the pump exit is ..... bar.

(*a*) 0.449 (*b*) 5.503
(*c*) 44.911 (*d*) 55.203

1015. At a hydroelectric power plant site, available head and flow rate are 24.5 m and 10.1 m^3/s respectively. If the turbine to be installed is required to run to 4 revolutions per second (rps) with an overall efficiency of 90%, the suitable type of turbine for this site is

(*a*) Francis (*b*) Kaplan
(*c*) Pelton (*d*) Propeller

1016. The velocity components in the x and y direction of a two dimensional potential flow are u & v respectively. Then $\dfrac{\delta u}{\delta x}$ is equal to

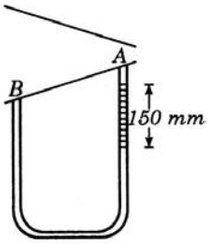
(*a*) $\dfrac{\delta V}{\delta x}$ (*b*) $-\dfrac{\delta V}{\delta x}$
(*c*) $\dfrac{\delta V}{\delta y}$ (*d*) $-\dfrac{\delta V}{\delta y}$

1017. A venturimeter of 20 mm throat diameter is used to measure the velocity of water in a horizontal pipe of 40 mm diameter. If the pressure difference between the pipe and throat sections, is found to be 30 kPa, then neglecting friction losses, the flow velocity is ..... m/s.

(*a*) 0.2 (*b*) 1.0

(*c*) 1.4 (*d*) 2.0

1018. A U-tube manometer with a small quantity of mercury is used to measure the static pressure difference between two locations *A* and *B* in a conical section through which an incompressible fluid flows. At a particular flow rate, the mercury column appears as shown in the figure. The density of mercury is 13600 kg/m^3 and g = 9.81 m/sec^2. Which of the following is correct?



(*a*) Flow direction is *A* to *B* and $p_A - p_B = 20kPa$

(*b*) Flow direction is *B* to *A* and $p_A - p_B = 1.4kPa$

(*c*) Flow direction is *A* to *B* and $p_B - p_A = 20kPa$

(*d*) Flow direction is *B* to *A* and $p_B - p_A = 1.4kPa$

1019. In the velocity diagram shown below, *u* = blade velocity, *c* = absolute fluid velocity and *w* = relative velocity of fluid and the subscripts 1 and 2 refer to inlet and outlet.

(*a*) an impulse turbine

(*b*) a reaction turbine

(*c*) a centrifugal compressor

(*d*) an axial flow compressor

1020. A leaf is caught in a whirlpool. At a given instant, the leaf is at a distance of 120 m from the centre of the whirlpool. The whirlpool can be described by the following velocity distribution:

$$V_r = -\left(\frac{60 \times 10^3}{2\pi r}\right) \text{and,}$$

$$V_o = \frac{300 \times 10^3}{2\pi r} \text{ m/s}$$

where, *r* (in metres) is the distance from the centre of the whirlpool. What will be the dis tance of the leaf from the centre, when it has moved through half a revolution?

(*a*) 48 m (*b*) 64 m

(*c*) 120 m (*d*) 142 m

1021. For a Newtonion fluid

(*a*) shear stress is proportional to shear strain

(*b*) rate of shear is proportional to shear strain

(*c*) shear stress is proportaional to rate of shear strain

(*d*) rate of shear stress is proportional to rate of shear strain.

1022. In a two dimensional velocity field with velocities *u* & *v* along *x* & *y* directions respectively, the convective acceleration along the *x*-direction is given by

(*a*) $u.\frac{\delta u}{\delta x} + v.\frac{\delta u}{\delta y}$ (*b*) $u.\frac{\delta u}{\delta x} + v.\frac{\delta v}{\delta y}$

(*c*) $u.\frac{\delta v}{\delta x} + v.\frac{\delta u}{\delta y}$ (*d*) $v.\frac{\delta u}{\delta x} + u.\frac{\delta u}{\delta y}$

1023. In a Pelton wheel, the bucket peripheral speed is 10 m/s, the water jet velocity is 25 m/s and the volumetric flow rate of the jet is 0.1 m^3/*s*. If the jet deflection angle is 120° and the flow is ideal, the power developed (in kW) is

(*a*) 7.5 (*b*) 15

(*c*) 22.5 (*d*) 37.5

1024. A two dimensional flow field has velocities along *x* & *y* directions given by, $u = x^2t$ & $v = -2xyt$ respectively, where *t* = time. The equation of streamlines is

(*a*) x^2y = Constant (*b*) xy^2 = Constant

(*c*) xy = Constant

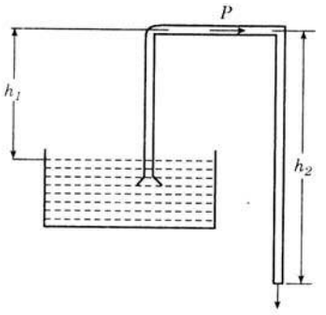
(*d*) not possible to determine

1025. The velocity profile in a fully developed laminar flow in a pipe of diameter '*D*' is given by, $u = \mu_o\,(1 - 4r^2/D^2)$, where *r* is the radial distance from the centre. If the viscosity of the fluid is μ, the pressure drop across a length '*L*' of the pipe is

(*a*) $\frac{\mu u_o L}{D^2}$ (*b*) $\frac{4\mu u_o L}{D^2}$

(*c*) $\frac{8\mu u_o L}{D^2}$ (*d*) $\frac{16\mu u_o L}{D^2}$

1026. A siphon draws water from a reservoir and discharges it out of atmospheric pressure. Assuming ideal fluid and the reservoir is large, the velocity at point *P* in the siphon tube is



(*a*) $\sqrt{2gh_1}$ (*b*) $\sqrt{2gh_2}$

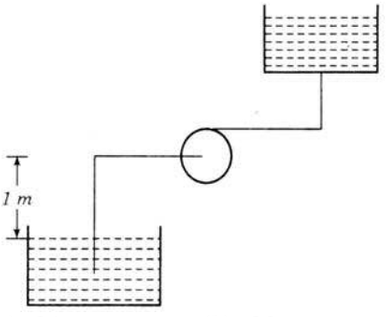
(*c*) $\sqrt{2g(h_2 - h_1)}$ (*d*) $\sqrt{2g(h_2 + h_1)}$

1027. A large hydraulic turbine is to generate 300 kW at 1000 rpm under a head of 40 m. For initial testing, a 1 : 4 scale model of the turbine operates under a head of 10 m. The power generated by the model (in kW) will be

(*a*) 2.34 (*b*) 4.68

(*c*) 9.38 (*d*) 18.75

1028. A horizontal shaft centrifugal pump lifts water at 65°C. The suction nozzle is 1 metre below pump centerline. The pressure at this point equals 200 kPa (gauge) and velocity is 3 m/s, steam tables show saturation pressure at 65°C is 25 kPa and the specific volume of the saturated liquid is 0.001020 m^3/kg. The pump net positive suction head (NPSH) in metres is



(*a*) 24 (*b*) 26

(*c*) 28 (*d*) 30

1029. Consider an incompressible laminar boundary layer flow over a flate plate of length '*L*', aligned with the direction of an oncoming uniform free stream. If '*F*' is the ratio of the drag force on the front half of the plate to the drag force on the rear half, then

(*a*) F < 1/2 (*b*) F = 1/2

(*c*) F = 1 (*d*) F > 1

1030. In a steady flow through a nozzle, the flow velocity on the nozzle axis is given by, $v = \mu_o(1 + 3x/L)i$, where x is the distance along the axis of the nozzle from its inlet plane and L is the length of the nozzle. The time required for a fluid particle on the axis to travel from the inlet to the exit plane of the nozzle is

(*a*) L/μ_o (*b*) $(L/3\mu_o)$ ln 4

(*c*) $L/4\mu_o$ (*d*) $L/2.5\mu_o$

1031. Consider steady laminar incompressible axi-symmetric fully developed viscous flow through a straight circular pipe of constant cross-sectional area at a Reynold's number of 5. The ratio of inertia force to viscous force on a fluid particle is

(*a*) 5 (*b*) 1/5

(*c*) 0 (*d*) ∞

1032. The inlet angle of runner blades of a Francis turbine is 90°. The blades are so shaped that tangential component of velocity at blade outlet is zero. The flow velocity remains constant throughout the blade passage and is equal to half of the blade velocity at runner inlet. The blade efficiency of the runner is ..... %.

(*a*) 25 (*b*) 50

(*c*) 80 (*d*) 89

1033. A model of a hydraulic turbine is tested at a head of 1/4th of that under which the full scale turbine works. The diameter of the model is half of that of full scale turbine. If '*N*' is the rpm of the full scale turbine, then the rpm of the model will be

(*a*) *N*/4 (*b*) *N*/2

(*c*) *N* (*d*) 2*N*

1034. Which combination of the following statements about steady incompressible forced vortex flow is correct?

P : Shear stress is zero at all points in the flow.

Q : Vorticity is zero at the points in the flow.

R : Velocity is directly proportional to the radius from the centre of the vortex.

S : Total mechanical energy per unit mass is constant in the entire flow field.

(*a*) P & Q (*b*) R & S

(*c*) P & R (*d*) P & S

1035. Match the items in column I & II.

Coloumn I	*Coloumn II*
P. Centrifugal compressor	1. Axial flow
Q. Centrifugal pump	2. Surging
R. Peltan wheel	3. Priming
S. Kaplon turbine	4. Pure impulse

(*a*) P-2, Q-3, R-4, S-1
(*b*) P-2, Q-3, R-1, S-4
(*c*) P-3, Q-4, R-1, S-2
(*d*) P-1, Q-2, R-3, S-4

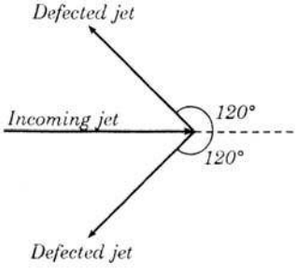
1036. For the continuity equation given by $\vec{\nabla}\vec{V} . = 0$ to be valid where $\vec{V}$ is the velocity vector, which one of the following is a necessary condition?

(*a*) Steady flow (*b*) Irrotational flow
(*c*) Inviscid flow (*d*) Incompressible flow

1037. Water having a density of 1000kg/m^3 issues from a nozzle with a velocity of 10 m/s and the jet strikes a bucket mounted on a Pelton wheel. The wheel rotates at 10 rad/s. The mean diameter of the wheel is 1 m. The jet is split into two equal streams by the bucket, such that each stream is deflected by 120°, as shown in the figure. Friction in the bucket may be neglected. Magnitude of the torque exerted by the water on the wheel, per unit mass flow rate of the incoming jet, is ..... N.m/k.s.

(*a*) 0 (*b*) 1.25
(*c*) 2.5 (*d*) 3.75

1038. Consider steady, incompressible and irrotional flow through a reducer in a horizontal pipe where the diameter is reduced from 20 cms to 10 cms. The pressure in the 20 cm pipe just upstream of the reducer is 150 kPa. The fluid has a vapor pressure of 50 kPa and a specific weight of 5kN/m^3. Neglecting frictional effects, the maximum discharge (in m^3/s) that can pass through the reducer without causing cavitation is



(*a*) 0.05 (*b*) 0.16
(*c*) 0.27 (*d*) 0.38

1039. You are asked to evaluate assorted fluid flows for their suitability in a given laboratory application. The following three flow choices, expressed in terms of the two dimensional velocity field in the *x*-*y* plane, are made available

P. $u = 2y, v = -3x$
Q. $u = 3xy, v = 0$
R. $u = -2y, v = 2y$

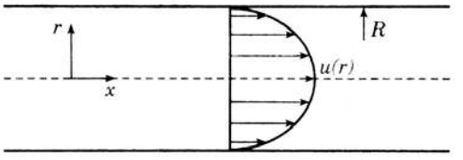
Which flow(s) should be recommended when the application requires the flow to be incompressible and irrotational?

(*a*) *P* and *R* (*b*) *Q*
(*c*) *Q* and *R* (*d*) *R*

1040. Water at 25°C is flowing through a 1 km long G.I. pipe of 200 mm diameter at the rate of 0.07m^2/*s*. If the value of Darcey friction factor for the pipe is 0.02 and density of water is 1000kg/m^3, the pumping (in kW) required to maintain the flow is

(*a*) 1.8 (*b*) 17.4
(*c*) 20.5 (*d*) 41.0

1041. The velocity profile of a fully developed laminar flow in a straight circular pipe as shown the figure, is given by the expression, $u(r) = -\frac{R^2}{4\mu}\left(\frac{dp}{dx}\right)\left(1 - \frac{r^2}{R^2}\right)$, where $\frac{dp}{dx}$ is a constant.



The average veloicty of fluid in the pipes is

(*a*) $-\frac{R^2}{8\mu}\left(\frac{dp}{dx}\right)$ (*b*) $-\frac{R^2}{4\mu}\left(\frac{dp}{dx}\right)$
(*c*) $-\frac{R^2}{2\mu}\left(\frac{dp}{dx}\right)$ (*d*) $-\frac{R^2}{\mu}\left(\frac{dp}{dx}\right)$

1042. For the stability of a floating body, under the influence of gravity alone, which of the following is true?

(*a*) Metacentre should be below centre of gravity
(*b*) Metacentre should be above centre of gravity

(*c*) Metacentre and centre of gravity must lie on the same horizontal line.

(*d*) Metacentre and centre of gravity must lie on the same vertical line.

1043. The maximum velocity of a one dimensional incompressible fully developed viscous flow, between two fixed parallel plates, is $6^{ms^{-1}}$. The mean velocity (in $m.s^{-1}$) of the flow is

(*a*) 2 (*b*) 3
(*c*) 4 (*d*) 5

1044. A hydraulic turbine develops 1000 kW power for a heat of 40 m. If the head is reduced to 20 m, the power developed (in kW) is

(*a*) 177 (*b*) 354
(*c*) 500 (*d*) 707

1045. A smooth pipe of diameter 200 mm carries water. The pressure in the pipe of section S_1 (elevation : 10 m) is 50 kPa. At section S_2 (elevation : 12 m), the pressure is 20 kPa and velocity is $2ms^{-1}$. Density of water is 1000 kg/m^3 and acceleration due to gravity is 9.8 ms^{-2}. Which of the following is true?

(*a*) Flow from S_1 to S_2 and heat loss is 0.53m

(*b*) Flow from S_2 to S_1 and heat loss is 0.53m

(*c*) Flow from S_1 to S_2 and heat loss is 0.06m

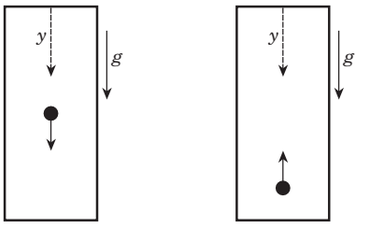
(*d*) Flow from S_2 to S_1 and heat loss is 0.06m

1046. Match the following:

P : Compressible flow U : Reynolds number
Q : Free surface flow V : Nusselt number
R : Boundary layer flow W : Weber number
S : Pipe flow X : Froude number
T : Heat convection Y : Mach number
Z : Skin friction coefficient

(*a*) P-U, Q-X, R-V, S-Z, T-W
(*b*) P-W, Q-X, R-Z, S-U, T-V
(*c*) P-Y, Q-W, R-Z, S-U, T-X
(*d*) P-Y, Q-W, R-Z, S-U, T-V

1047. Consider the following two cases of movement of particles. in case, I, the particle moves along the positive y-direction and in Case II, the particle moves along, negative y-direction. Gravity acts along the positive y-direction. Which **ONE** of the following options corresponds to the **CORRECT** directions of buoyancy acting on the particles?



Case I *Case II*

(*a*) Positive y-direction for both the cases
(*b*) Negative y-direction for Case I, positive y-direction for Case II
(*c*) Negative y-direction for both the cases
(*d*) Positive y-direction for Case I, negative y-direction for Case II [GATE 2011]

1048. Match the pumps in Group I with the corresponding fluids in Group II.

Group I

P. Gear pump. Q. Peristaltic pump

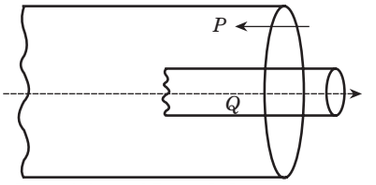
Group II

I. Highly viscous liquid
II. Aqueous sterile liquid
III. Slurry.

(*a*) P-III, Q-I, (*b*) P-II, Q-I,
(*c*) P-III, Q-II (*d*) P-I, Q-II

[GATE 2011]

1049. Two liquids (P and Q) having same viscosity are flowing through a double pipe heat exchanger as shown in the schematic below.



Densities of P and Q are 1000 and 800 kg/m^3 respectively. The average velocities of the liquids P and Q are 1 and 2.5 m/s respectively. The inner diameters of the pipes are 0.31 and 0.1 m. Both pipes are 5 mm thick. The ratio of the Reyonlds numbers Re_p to Re_Q is

(*a*) 2.5 (*b*) 1.5
(*c*) 1 (*d*) 4 [GATE 2011]

1050. A liquid is flowing through the following piping network. The length of pipe sections P, Q, and S shown in the schematic are equal. The diameters of the sections P and R equal and the diameter of the section Q is twice that of S. The flow is steady and laminar. Neglecting curvature and entrance effects, the ratio of the Volumetric flow rate in the pipe section Q to that in S is

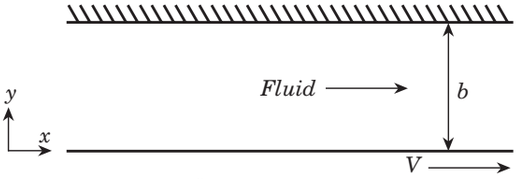
(*a*) 16 (*b*) 8
(*c*) 2 (*d*) 1 [GATE 2011]

1051. Water is flowing under laminar conditions in a pipe of length L. If the diameter of the pipe is doubled, for a constant volumetric flow rate, the pressure drop across the pipe.
(*a*) Decreases 2 times
(*b*) Decreases 16 times
(*c*) Increases 2 times
(*d*) Increases 16 times [GATE 2012]

1052. For uniform laminar flow (in the x-direction) past a flat plate at high Reynolds number, the local boundary layer thickness (δ) varies with the distance along the plate (x) as
(*a*) $\delta \alpha x^{1/4}$ (*b*) $\delta \alpha x^{1/3}$
(*c*) $\delta \alpha x^{1/2}$ (*d*) $\delta \alpha x$ [GATE 2012]

1053. A bed of spherical glass beads (density 3000 kg/m^3, diameter 1 mm, bed porosity 0.5) is to be fluidized by a liquid of density 1000 kg/m^3 and viscosity 0.1 Pa.s. Assume that the Reynolds number based on particle diameter is very small compared to one. If g = 10 m/s^2, then the minimum velocity (in m/s) required to fluidize the bed is
(*a*) 3.33×10^{-4} (*b*) 3.33×10^{-1}
(*c*) 3 (*d*) 30 [GATE 2012]

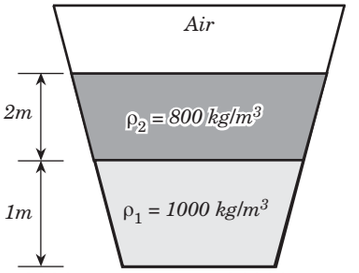
1054. The steady, laminar velocity profile in the x-direction is



(*a*) $V\left[\frac{y}{b}\right]$ (*b*) $V\left[\left(\frac{y}{b}\right)^2 - 1\right]$
(*c*) $V\left[1 - \left(\frac{y}{b}\right)^2\right]$ (*d*) $V\left[1 - \frac{y}{b}\right]$
[GATE 2012]

1055. In Q.1054, the force per unit area (in the x-direction) that must be exerted on the bottom plate to maintain the flow is
(*a*) $\mu V/b$ (*b*) $-\mu V/b$
(*c*) $2\mu V/b$ (*d*) $-2\mu V/b$
[GATE2012]

1056. An open tank contains two immiscible liquids of densities (800 kg/m^3 and 1000 kg/m^3) as shown in the figure. If g = 10 m/s^2, under static conditions, the gauge pressure at the bottom of the tank in Pa is



(*a*) 13000 (*b*) 26000
(*c*) 40000 (*d*) 150000
[GATE 2013]

Hint : $P_{bottom} = (2)\rho_2 g + (1)\rho_1 g$
$= (2 \times 800 \times 10) + (1000 \times 10)$
$= 16000 + 10000 = 26000 Pa.$

1057. The apparent viscosity of a fluid is given by $0.007 \left|\frac{dV}{dy}\right|^{0.3}$, where, $\left(\frac{dV}{dy}\right)$ is the velocity gradient, the fluid is
(*a*) Bingham plastic (*b*) Dilatants
(*c*) Pseudoplastic (*d*) Thixotropic
Hint : For non Newtonian fluid,
$\tau = \eta \frac{du}{dy} = k \left|\frac{du}{dy}\right|^{n-1} \frac{du}{dy}$
here η is apparent viscosity
Compare it, $\eta = K \left|\frac{du}{dy}\right|^{n-1} = 0.007 \left|\frac{du}{dy}\right|^{0.3}$

$\eta - 1 = 0.3 \Rightarrow \eta = 1.3$

$n > 1$, therefore fluid is dilatent. [GATE 2013]

1058. The mass balance for a fluid with density (ρ) and velocity vector ($\vec{V}$) is

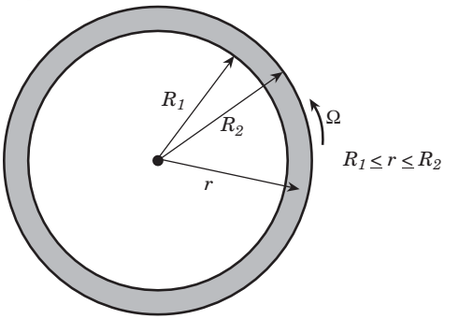
(*a*) $\frac{\partial \rho}{\partial t} + \nabla . (\rho \vec{V}) = 0$

(*b*) $\frac{\partial \rho}{\partial t} + \vec{V} . (\nabla \rho) = 0$

(*c*) $\frac{\partial \rho}{\partial t} + \rho . (\nabla . \vec{V}) = 0$

(*d*) $\frac{\partial \rho}{\partial t} - \vec{V} . (\nabla \rho) = 0$ [GATE 2013]

1059. An incompressible Newtonian fluid, filled in an annular gap between two concentric cylinders of radii R_1 and R_2 as shown in the figure, is flowing under steady state conditions. The outer cylinder is rotating with an angular velocity of Ω while the inner cylinder is stationary. Given that $(R_2 - R_1) < R_1$, the profile of the θ-component of the velocity V_θ can be approximated by,



(*a*) $R_2\Omega$ (*b*) $\frac{(r - R_2)}{(R_2 - R_1)} r\Omega$

(*c*) $\frac{(r + R_1)}{(R_2 + R_1)} R_1\Omega$ (*d*) $\frac{(r - R_1)}{(R_2 - R_1)} R_2\Omega$

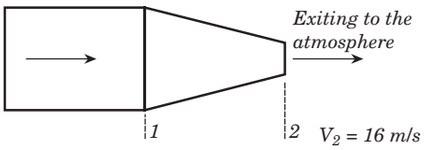
[GATE 2013]

1060. For a Newtonian fluid flowing in a circular pipe under steady state conditions in fully developed laminar flow, the Fanning friction factor is

(*a*) $0.046\ \mathrm{Re}^{-0.2}$ (*b*) $0.0014 + \frac{0.125}{\mathrm{Re}^{0.32}}$

(*c*) $\frac{16}{\mathrm{Re}}$ (*d*) $\frac{24}{\mathrm{Re}}$ [GATE 2013]

1061. Water (density 1000 kg/m^3) is flowing through a nozzle, as shown below and exiting to the atmosphere. The relationship between the diameters of the nozzle at locations 1 and 2 is $D_1 = 4\ D_2$. The average velocity of the stream at location 2 is 16 m/s and the frictional loss between location 1 and location 2 is 10000 Pa. Assuming steady state and turbulent flow, the gauge pressure in Pa, at location 1 is



(*a*) 80236 (*b*) 102500

(*c*) 137500 (*d*) 185200

Hint : $Q = A_1V_1 = A_2V_2$

$$V_1 = \frac{V_2A_2}{A_1} = V_2\left(\frac{D_2}{D_1}\right)^2 = 16\left(\frac{1}{4}\right)^2 = 1 \text{ m/s}$$

Apply Bernoulli's Equation,

$$\frac{P_1}{\rho g} + Z_1 + \frac{V_1^2}{2g} = \frac{P_2}{\rho g} + Z_2 + \frac{V_2^2}{2g}$$

$$Z_1 = Z_2 \Rightarrow \frac{P_2}{\rho g} + \frac{V_2^2 - V_1^2}{2g} = \frac{\rho_1}{\rho_g}$$

$$= \frac{10000}{(1000)\ (9.8)} + \frac{(16)^2 - 1}{2(9.8)} = \frac{\rho_1}{\rho_g}$$

$\Rightarrow P_1 = 137500$ Pa [GATE 2013]

1062. In the elutriation leg of a commercial crystallizer containing a mixture of coarse and very fine crystals of the same material, a liquid is pumped vertically upward. The liquid velocity is adjusted such that it is slightly lower than the terminal velocity of the coarse crystals only. Hence

(*a*) The very fine and coarse crystals will both be carried upward by the liquid

(*b*) The very fine and coarse crystals will both settle at the bottom of the tube

(*c*) The very fine crystals will be carried upward and the coarse crystals will settle

(*d*) The coarse crystals will be carried upward and the very fine crystals will settle. [GATE 2013]

1063. In case of a pressure driven laminar flow of a Newtonian fluid of viscosity (μ) through a horizontal circular pipe, the velocity of the fluid is proportional to

(*a*) μ (*b*) $\mu^{0.5}$

(*c*) μ^{-1} (*d*) $\mu^{-0.5}$ [GATE 2014]

1064. Which of the following statements are correct?

P. For a rheopectic fluid, the apparent viscosity increases with time under a constant applied shear stress.

Q. For a pseudoplastic fluid, the apparent viscosity decreases with time under a constant applied shear stress.

R. For a Bingham plastic, the apparent viscosity increases exponentially with the deformation rate.

S. For a dilatent fluid, the apparent viscosity increases with increasing deformation rate :

(*a*) P and Q only (*b*) Q and R only
(*c*) R and S only (*d*) P and S only

[GATE 2014]

1065. Slurries are most conveniently pumped by a

(*a*) Syringe pump (*b*) Diaphragm pump
(*c*) Vacuum pump (*d*) Gear pump

[GATE 2014]

1066. An incompressible fluid is flowing through a contraction section of length L and has a 1-D (x-direction) steady state velocity, $u = u_0\left(1 + \frac{2x}{L}\right)$. If u_0 = 2 m/s and L = 3 m, the convective acceleration (in m/s2) of the fluid at L is

(*a*) 2 (*b*) 4
(*c*) 6 (*d*) 8

Hint : Convective acceleration

$$\frac{du}{dt} = \frac{\partial u}{\partial t} + u\frac{du}{dx} + ...$$

$$= u_0\left(1 + \frac{2x}{L}\right)\frac{2u_0}{L}$$

Putting $u_0 = 2$, $L = 3$

at $x = L$, convective acceleration

$$= 2\left(1 + \frac{2L}{L}\right)\left(\frac{2 \times 2}{3}\right) = 8 \text{ m/s}^2$$

[GATE 2014]

1067. In a steady incompressible flow, the velocity distribution is given by $\overline{V} = 3x\hat{I} - Py\hat{J} + 5z\hat{K}$, where V is in m/s and x, y and z are in m. In order to satisfy the mass conservation, the value of the constant P (in s^{-1}) is

(*a*) 2 (*b*) 4
(*c*) 6 (*d*) 8

Hint : Given, $\overline{V} = 3x\hat{I} - Py\hat{J} + 5z\hat{K}$

For mass conservation at constant density

$$\Delta \cdot \overline{V} = 0$$

$$\Rightarrow \quad \frac{\partial v_x}{\partial x} + \frac{\partial v_y}{\partial y} + \frac{\partial v_z}{\partial z} = 0$$

$\Rightarrow 3 - P + 5 = 0 \Rightarrow P = 8$ [GATE 2014]

1068. Match the following

Group I

P. Turbulence Q. NPSH
R. Ergun equation S. Rotameter
T. Power number

Group II

I. Reciprocating pump
II. Packed bed
III. Fluctuating velocity
IV. Impeller
V. Vena contracta

(*a*) P-III, R-II, T-IV (*b*) Q-V, R-II, S-III
(*c*) P-III, R-IV, T-II (*d*) Q-III, S-V, T-IV

[GATE 2014]

1069. In a steady and incompressible flow of a fluid (density = 1.25 kg m^{-3}), the difference between stagnation and static pressures at the same location in the flow is 30 mm of mercury (density = 13600 kg m^{-3}). Considering gravitational acceleration as 10 m s^{-2}, the fluid speed (in m s^{-1}) is

(*a*) 20.6 (*b*) 42.8 (*c*) 80.8 (*d*) 96.5

Hint : From Bernoulli's equation

$$\frac{P_s}{\rho_f g} + \frac{v^2}{2g} = \frac{P}{\rho_f g} + 0$$

$$\Rightarrow \qquad v = \sqrt{\frac{2(P - P_s)}{\rho_f}}$$

$$\text{Given, } \frac{P - P_s}{\rho_f} = \frac{\rho_{gh}}{\rho_f} = \frac{13600 \times 10 \times 30 \times 10^{-3}}{1.25}$$

$$= 3264$$

$$\therefore \qquad v = \sqrt{2 \times 3264} = 80.8 \text{ m/sec.}$$

[GATE 2014]

1070. Two different liquids are flowing through different pipes of the same diameter. In the first pipe, the flow is laminar with centerline velocity, $V_{max.1}$, whereas in the second pipe, the flow is turbulent. For turbulent flow, the average velocity is 0.82 times the centerline velocity, $V_{max.2}$. For equal volumetric flow rates in both the pipes, the ratio $V_{max.1}/V_{max.2}$ (up to two decimal places) is

(*a*) 0.64 (*b*) 1.64

(*c*) 2.24 (*d*) 3.64

Hint : For laminar flow

$$V_{avg.1} = 0.5\ V_{max.1}$$

For Turbulent flow

$$V_{avg.2} = 0.82\ V_{max.2} \text{ (given)}$$

Since volumetric flow rate is same

$$Q_1 = Q_2$$

$$A_1 V_{avg.1} = A_2 V_{avg.2}$$

Given $A_1 = A_2$

So, $V_{avg.1} = V_{avg.2}$

$\Rightarrow$ $05\ V_{max.1} = 0.82\ V_{max.2}$

$$\Rightarrow \quad \frac{V_{max.1}}{V_{max.2}} = 1.64$$ [GATE 2015]

1071. A cylindrical packed bed of height 1 m is filled with equal sized spherical particles. The particles are nonporous and have a density of 1500 kg/m^3. The void fraction of the bed is 0.45. The bed is fluidized using air (density 1 kg/m^3). If the acceleration due to gravity is 9.8 m/s^2, the pressure drop (in pa) across the bed at incipient fluidization (up to one decimal place) is

(*a*) 8079.6 (*b*) 2659.4
(*c*) 9024.5 (*d*) 6254.6

Hint : For incipient fluidization

$$\frac{\Delta P}{L} = g\ (1 - \varepsilon)\ (\rho_P - \rho)$$

where, $\varepsilon = 0.45$

$\rho_p = 1500$ kg/m^3 $\rho = 1$ kg/m^3

and, $L = 1m$ (height of the bed)

$\Delta P = 9.8 \times (1 - 0.45)\ (1500 - 1) \times 1$

$= 8079.6$ Pa [GATE 2015]

1072. For uniform laminar flow over a flat plate, the thickness of the boundary layer, δ, at a distance x from the leading edge of the plate follows the relation:

(*a*) $\delta(x) \propto x^{-1}$ (*b*) $\delta(x) \propto x$
(*c*) $\delta(x) \propto x^{1/2}$ (*d*) $\delta(x) \propto x^{-1/2}$

[GATE 2015]

1073. A centrifugal pump delivers water at the rate of 0.22 m^3/s from a reservoir at ground level to another reservoir at a height H, through a vertical pipe of 0.2 m diameter. Both the reservoirs are open to atmosphere. The power input to the pump is 90 kW and it operates with an efficiency of 75%.

Data : Fanning friction factor for pipe flow is f = 0.004. Neglect other head losses.

Take gravitational acceleration, g = 9.8 m/s^2 and density of water is 1000 kg/m^3.

The height H, in meters, to which the water can be delivered (up to one decimal place) is

(*a*) 18 (*b*) 36
(*c*) 54 (*d*) 76

Hints : Given $Q = 0.22$ m^2/sec.

$$V_2 = \frac{0.22}{\pi/4 \times (0.2)^2} = 7\text{m/sec}$$

$$W = 90 \text{ kW}$$

$$W \text{ in head unit } = \frac{90 \times 10^3}{\rho Q g}$$

Applying Bernaulli's equation between (1) and (2)

$$\frac{\rho_1}{\rho_g} z_1 + \frac{V_1^2}{2g} + hf + \eta w = \frac{\rho_2}{\rho g} + z_2 + \frac{V_2^2}{2g} \quad \text{...(I)}$$

and, $Z_2 = H$

$$h_f = \frac{4fHV^2}{2gD} = \frac{4 \times 0.004 \times H \times 7^2}{2 \times 9.8 \times 0.2} = 0.2 \text{ Hm}$$

$$\text{(I)} \Rightarrow 0.2H + 0.75 \times \frac{90 \times 10^3}{0.22 \times 1000 \times 9.8} = H + \frac{49}{2 \times 9.8}$$

$\Rightarrow 0.2H + 31.308 = H + 2.5$

$\Rightarrow \quad 0.8H = 28.808$

$H = 36.01$ m ≈ 36 m

[GATE 2015]

1074. For fanning friction factor f (for flow in pipes) and drag coefficient C_D (for flow over immersed bodies), which of the following statements are true?

P. f accounts only for the skin friction.
Q. C_D accounts only for the form friction.
R. C_D accounts for both skin friction and form friction
S. Both f and CD depends on the Reynolds number
T. For laminar flow through a pipe, f doubles on doubling the volumetric flow rate.

(*a*) R,S,T (*b*) P,Q,S
(*c*) P,R,S (*d*) P,Q,S,T

[GATE 2015]

ANSWERS

1. (*a*)	2. (*c*)	3. (*d*)	4. (*a*)	5. (*c*)
6. (*a*)	7. (*b*)	8. (*b*)	9. (*b*)	10. (*d*)
11. (*c*)	12. (*a*)	13. (*a*)	14. (*c*)	15. (*b*)
16. (*b*)	17. (*c*)	18. (*d*)	19. (*d*)	20. (*a*)
21. (*c*)	22. (*b*)	23. (*d*)	24. (*c*)	25. (*a*)
26. (*b*)	27. (*b*)	28. (*d*)	29. (*b*)	30. (*b*)
31. (*a*)	32. (*d*)	33. (*c*)	34. (*a*)	35. (*c*)
36. (*a*)	37. (*a*)	38. (*b*)	39. (*a*)	40. (*b*)
41. (*c*)	42. (*c*)	43. (*a*)	44. (*a*)	45. (*d*)
46. (*a*)	47. (*c*)	48. (*b*)	49. (*b*)	50. (*c*)
51. (*a*)	52. (*b*)	53. (*c*)	54. (*a*)	55. (*a*)
56. (*a*)	57. (*b*)	58. (*c*)	59. (*a*)	60. (*c*)
61. (*d*)	62. (*b*)	63. (*a*)	64. (*b*)	65. (*c*)
66. (*c*)	67. (*b*)	68. (*b*)	69. (*a*)	70. (*b*)
71. (*c*)	72. (*a*)	73. (*c*)	74. (*c*)	75. (*a*)
76. (*c*)	77. (*c*)	78. (*a*)	79. (*c*)	80. (*c*)
81. (*a*)	82. (*b*)	83. (*c*)	84. (*d*)	85. (*a*)
86. (*c*)	87. (*a*)	88. (*d*)	89. (*a*)	90. (*d*)
91. (*b*)	92. (*a*)	93. (*d*)	94. (*a*)	95. (*a*)
96. (*d*)	97. (*b*)	98. (*d*)	99. (*c*)	100. (*c*)
101. (*b*)	102. (*b*)	103. (*a*)	104. (*c*)	105. (*b*)
106. (*b*)	107. (*d*)	108. (*a*)	109. (*a*)	110. (*b*)
111. (*a*)	112. (*c*)	113. (*a*)	114. (*b*)	115. (*a*)
116. (*a*)	117. (*d*)	118. (*a*)	119. (*d*)	120. (*c*)
121. (*a*)	122. (*b*)	123. (*a*)	124. (*c*)	125. (*c*)
126. (*a*)	127. (*c*)	128. (*a*)	129. (*d*)	130. (*b*)
131. (*a*)	132. (*c*)	133. (*a*)	134. (*b*)	135. (*a*)
136. (*a*)	137. (*a*)	138. (*a*)	139. (*b*)	140. (*a*)
141. (*c*)	142. (*d*)	143. (*a*)	144. (*a*)	145. (*b*)
146. (*a*)	147. (*b*)	148. (*a*)	149. (*c*)	150. (*d*)
151. (*d*)	152. (*d*)	153. (*d*)	154. (*a*)	155. (*d*)
156. (*c*)	157. (*b*)	158. (*b*)	159. (*c*)	160. (*d*)
161. (*a*)	162. (*d*)	163. (*a*)	164. (*d*)	165. (*d*)
166. (*d*)	167. (*b*)	168. (*d*)	169. (*c*)	170. (*d*)
171. (*b*)	172. (*d*)	173. (*c*)	174. (*b*)	175. (*a*)
176. (*b*)	177. (*d*)	178. (*a*)	179. (*c*)	180. (*b*)
181. (*c*)	182. (*a*)	183. (*c*)	184. (*a*)	185. (*a*)
186. (*a*)	187. (*b*)	188. (*a*)	189. (*b*)	190. (*a*)
191. (*b*)	192. (*a*)	193. (*c*)	194. (*c*)	195. (*d*)
196. (*c*)	197. (*d*)	198. (*b*)	199. (*b*)	200. (*c*)
201. (*a*)	202. (*c*)	203. (*d*)	204. (*d*)	205. (*a*)
206. (*b*)	207. (*b*)	208. (*a*)	209. (*c*)	210. (*c*)
211. (*b*)	212. (*c*)	213. (*a*)	214. (*d*)	215. (*c*)
216. (*a*)	217. (*c*)	218. (*d*)	219. (*d*)	220. (*b*)
221. (*b*)	222. (*d*)	223. (*b*)	224. (*d*)	225. (*b*)
226. (*b*)	227. (*a*)	228. (*b*)	229. (*a*)	230. (*d*)
231. (*d*)	232. (*a*)	233. (*a*)	234. (*d*)	235. (*a*)
236. (*b*)	237. (*c*)	238. (*d*)	239. (*a*)	240. (*c*)
241. (*d*)	242. (*c*)	243. (*a*)	244. (*d*)	245. (*c*)
246. (*a*)	247. (*b*)	248. (*d*)	249. (*d*)	250. (*a*)
251. (*c*)	252. (*a*)	253. (*d*)	254. (*b*)	255. (*a*)
256. (*c*)	257. (*a*)	258. (*b*)	259. (*b*)	260. (*a*)
261. (*d*)	262. (*a*)	263. (*c*)	264. (*b*)	265. (*a*)
266. (*b*)	267. (*c*)	268. (*a*)	269. (*c*)	270. (*a*)

271. (*b*) 272. (*a*) 273. (*d*) 274. (*b*) 275. (*a*)
276. (*b*) 277. (*b*) 278. (*d*) 279. (*a*) 280. (*c*)
281. (*d*) 282. (*a*) 283. (*c*) 284. (*b*) 285. (*a*)
286. (*b*) 287. (*a*) 288. (*a*) 289. (*a*) 290. (*d*)
291. (*c*) 292. (*b*) 293. (*b*) 294. (*b*) 295. (*a*)
296. (*d*) 297. (*b*) 298. (*a*) 299. (*b*) 300. (*a*)
301. (*b*) 302. (*d*) 303. (*d*) 304. (*c*) 305. (*b*)
306. (*a*) 307. (*a*) 308. (*a*) 309. (*a*) 310. (*c*)
311. (*c*) 312. (*b*) 313. (*c*) 314. (*a*) 315. (*a*)
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321. (*b*) 322. (*b*) 323. (*c*) 324. (*d*) 325. (*a*)
326. (*a*) 327. (*b*) 328. (*a*) 329. (*d*) 330. (*c*)
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336. (*a*) 337. (*d*) 338. (*a*) 339. (*a*) 340. (*c*)
341. (*b*) 342. (*c*) 343. (*d*) 344. (*a*) 345. (*c*)
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361. (*b*) 362. (*d*) 363. (*d*) 364. (*b*) 365. (*d*)
366. (*d*) 367. (*b*) 368. (*a*) 369. (*b*) 370. (*a*)
371. (*d*) 372. (*c*) 373. (*d*) 374. (*a*) 375. (*a*)
376. (*b*) 377. (*c*) 378. (*a*) 379. (*b*) 380. (*b*)
381. (*a*) 382. (*a*) 383. (*a*) 384. (*d*) 385. (*b*)
386. (*b*) 387. (*b*) 388. (*b*) 389. (*a*) 390. (*c*)
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426. (*a*) 427. (*b*) 428. (*c*) 429. (*d*) 430. (*a*)
431. (*b*) 432. (*c*) 433. (*b*) 434. (*a*) 435. (*c*)
436. (*a*) 437. (*b*) 438. (*b*) 439. (*d*) 440. (*b*)
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461. (*b*) 462. (*a*) 463. (*b*) 464. (*c*) 465. (*a*)
466. (*d*) 467. (*a*) 468. (*b*) 469. (*a*) 470. (*b*)
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476. (*d*) 477. (*c*) 478. (*a*) 479. (*b*) 480. (*c*)
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