Question Bank
of
Fluid Mechanics and Machinery (ME-313)
for
ICD (5^{th} Semester)

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MCQ (Multiple choice questions)
Only one answer is correct

1. The pressure at a point in a fluid will not be same in all the directions when the fluid is
(a) Moving
(b) Viscous
(c) Viscous and static
(d) In-viscous and moving
(e) Viscous and moving.

2. An object having 10 kg mass weighs 9.81kg on a spring balance. The value of 'g' at this place is
(a) 10m/sec^2
(b) 9.81 m/sec^2
(c) 10.2m/sec
(d) 9.75 m/sec^2
(e) 9 m/sec^2

3. The tendency of a liquid surface to contract is due to the following property
(a) Cohesion
(b) Adhesion
(c) Viscosity
(d) Surface tension
(e) Elasticity.

4. For very great pressures, viscosity of moss gases and liquids
(a) Remains same
(b) Increases
(c) Decreases
(d) Shows erratic behavior
(e) None of the above

5. A fluid in equilibrium can't sustain
(a) Tensile stress
(b) Compressive stress
(c) Shear stress
(d) Bending stress
(e) All of the above.

6. Viscosity of water in comparison to mercury is
(a) Higher
(b) Lower
(c) Same
(d) Higher/Lower depending on temperature
(e) Unpredictable.

7. The bulk modulus of elasticity
(a) Has the dimensions of 1/pressure
(b) Increases with pressure
(c) Is large when fluid is more compressible
(d) Is independent of pressure and viscosity
(e) Is directly proportional to flow.

8. Mercury does not wet glass. This is due to property of liquid known as
(a) Adhesion
(b) Cohesion
(c) Surface tension
(d) Viscosity
(e) Compressibility.

9. The property of a fluid which enables it to resist tensile stress is known as
(a) Compressibility
(b) Surface tension
(c) Cohesion
(d) Adhesion
(e) Viscosity.

10. Property of a fluid by which molecules of different kinds of fluids are attracted to each other is called
(a) Adhesion
(b) Cohesion
(c) Viscosity
(d) Compressibility
(e) Surface tension.

11. Fluid is a substance which offers no resistance to change of
(a) Pressure
(b) Flow

(c) Shape
(d) Volume
(e) Temperature

12. In a static fluid
(a) Resistance to shear stress is small
(b) Fluid pressure is zero
(c) Linear deformation is small
(d) Only normal stresses can exist
(e) Viscosity is nil.

13. A fluid is said to be ideal if it is
(a) Incompressible
(b) In viscous
(c) Viscous and Incompressible
(d) In viscous and compressible
(e) In viscous and incompressible.

14. If no resistance is encountered by displacement, such a substance is known as
(a) Fluid
(b) Water
(c) Gas
(d) Perfect solid
(e) Ideal fluid.

15. The volumetric change of the fluid caused by a resistance is known as

(a) Volumetric strain
(b) Volumetric index
(c) Compressibility
(d) Adhesion
(e) Cohesion.

16. Liquids
(a) Cannot be compressed
(b) Occupy definite volume
(c) Are not affected by change in pressure and temperature
(d) Are not viscous
(e) None of the above.

17. Density of water is maximum at
(a) 0°C
(b) 0°K
(c) 4°C
(d) 100°C
(e) 20°C

18. Property of a fluid by which its own molecules are attracted is called
(a) Adhesion
(b) Cohesion
(c) Viscosity
(d) Compressibility
(e) Surface tension.

19. Specific weight of water in S.I. units is equal to
(a) 1000 N/m^3
(b) 10000 N/m^3
(c) 9.81 x10^3 N/m^3
(d) 9.81 x10^6N/m^3
(e) 9.81 N/m^3

20. Which of the following is dimensionless?
(a) Specific weight
(b) Specific volume
(c) Specific speed
(d) Specific gravity
(e) Specific viscosity.

21. A balloon lifting in air follows the following principle
(a) Law of gravitation
(b) Archimedes principle
(c) Principle of buoyancy
(d) All of the above
(e) Continuity equation.

22. The increase of temperature results in
(a) Increase in viscosity of gas
(b) Increase in viscosity of liquid
(c) Decrease in viscosity of gas
(d) Decrease in viscosity of liquid
(e) (a) and (d) above.

23. Surface tension has the units of
(a) N/m^2
(b) N/m^3
(c) N/m
(d) N/m^{-1}

35. Surface tension
(a) Acts in the plane of the interface normal to any line in the surface
(b) Is also known as capillarity
(c) Is a function of the curvature of the interface
(d) Decreases with fall in temperature
(e) Has no units.

36. The stress-strain relation of the Newtonian fluid is
(a) Linear
(b) Parabolic
(c) Hyperbolic
(d) Inverse type
(e) None of the above.

37. A liquid compressed in cylinder has a volume of 0.04 m3 at 50 kg/cm2 and a volume of 0.039 m3 at 150 kg/cm2. The bulk modulus of elasticity of liquid is
(a) 400 kg/cm^2

(b) 4000 kg/cm^2

(c) 40 x 105 kg/cm^2

(d) 40 x 106 kg/cm^2

(e) None of the above.

38. The units of viscosity are
(a) Meter sq per sec
(b) Kg sec/Meter
(c) Newton-sec per metre2
(d) Newton-sec per meter
(e) None of the above.

39. Kinematic viscosity is dependent upon
(a) Pressure
(b) Distance
(c) Level
(d) Flow
(e) Density

40. Units of surface tension are
(a) energy/unit area
(b) Distance
(c) Both of the above
(d) It has no units
(e) None of the above.

41. Which of the following meters is not associated with viscosity?
(a) Red wood
(b) Say bolt
(c) Engler
(d) Orsat
(e) None of the above.

42. Choose the correct relationship
(a) Specific gravity = gravity x density
(b) Dynamic viscosity = Kinematic viscosity x density
(c) Gravity = specific gravity x density
(d) Kinematic viscosity = dynamic viscosity x density
(e) Hydrostatic force = surface tension x gravity.

43. Dimensions of surface tension are
(a) $M^1L^0T^2$
(b) $M^2L^0T^2$
(c) $M^1L^2T^2$
(d) $M^1L^1T^2$
(e) $M^1L^0T^3$

44. For manometer, a better liquid combination is one having
(a) Higher surface tension
(b) Lower surface tension
(c) Surface tension is no criterion
(d) High density and viscosity
(e) Low density and viscosity

45. If mercury in a barometer is replaced by water, the height of 3.75 cm of mercury will be following cm of water
(a) 51 cm
(b) 50 cm
(c) 52 cm
(d) 52.2 cm
(e) 51.7 cm.

46. Choose the wrong statement. Alcohol is used in manometer, because

(a) Its vapor pressure is low
(b) It provides suitable meniscus for the inclined tube
(c) Its density is less
(d) It provides longer length for a given pressure difference
(e) It provides accurate readings.

48. The property of fluid by virtue of which it offers resistance to shear is called
(a) Surface tension
(b) Adhesion
(c) Cohesion
(d) Viscosity
(e) All of the above.

49. Choose the wrong statement
(a) Fluids are capable of flowing
(b) Fluids conform to the shape of the containing vessels
(c) When in equilibrium, fluids cannot sustain tangential forces
(d) When in equilibrium, fluids can sustain shear forces
(e) Fluids have some degree of comprehensibility and offer little resistance to form.

50. The density of water is 1000 kg/m3 at
(a) 0°C
(b) 0°K
(c) 4°C
(d) 20°C
(e) All temperature

51. If w is the specific weight of liquid and k the depth of any point from the surface, then pressure intensity at that point will be
(a) h
(b) wh
(c) w/h
(d) h/w
(e) h/wh.

52. Choose the wrong statement
(a) Viscosity of a fluid is that property which determines the amount of its resistance to a shearing force
(b) Viscosity is due primarily to interaction between fluid molecules
(c) Viscosity of liquids decreases with increase in temperature
(d) Viscosity of liquids is appreciably affected by change in pressure
(e) Viscosity is expressed as poise, stoke, or saybolt seconds.

53. The units of kinematic viscosity are
(a) meter sq per sec
(b) kg sec/meter
(c) newton-sec per meter
(d) newton-sec per meter
(e) None of the above.

54. The ratio of absolute viscosity to mass density is known as
(a) Specific viscosity
(b) Viscosity index
(c) Kinematic viscosity
(d) Coefficient of viscosity
(e) Coefficient of compressibility.

55. Kinematic viscosity is equal to
(a) Dynamic viscosity/density
(b) Dynamic viscosity x density
(c) Density/dynamic viscosity
(d) 1/Dynamic viscosity x density
(e) Same as dynamic viscosity

56. Which of the following is the unit of kinematic viscosity?
(a) Pascal
(b) Poise
(c) Stoke
(d) Faraday
(e) None of the above.

57. A one-dimensional flow is one which
(a) Is uniform flow
(b) Is steady uniform flow
(c) Takes place in straight lines

(d) Involves zero transverse component of flow
(e) Takes place in one dimension.

58. Alcohol is used in manometers because
(a) it has low vapour pressure
(b) it is clearly visible
(c) It has low surface tension
(d) it can provide longer column due to low density
(e) is provides suitable meniscus.

59. A pressure of 25 m of head of water is equal to
(a) 25 kN/m^2
(a) 245 kN/ m^2
(c) 2500 kN/ m^2
(d) 2.5kN/ m^2
(f) 12.5 kN/ m^2

60. Specific weight of sea water is more that of pure water because it contains
(a) dissolved air
(b) dissolved salt
(c) suspended matter
(d) all of the above
(e) heavy water.

61. If 850 kg liquid occupies volume of one cubic meter, men 0.85 represents its
(a) specific weight
(b) specific mass
(c) specific gravity
(d) specific density
(e) none of the above.

62. Free surface of a liquid tends to contract to the smallest possible area due to force of
(a) surface tension
(b) viscosity
(c) friction
(d) cohesion
(e) adhesion.

63. A bucket of water is hanging from a spring balance. An iron piece is suspended into water without touching sides of bucket from another support. The spring balance reading will
(a) increase
(b) decrease
(c) remain same
(d) increase/decrease depending on depth of immersion
(e) unpredictable.

64. Falling drops of water become spheres due to the property of
(a) adhesion
(b) cohesion
(c) surface tension
(d) viscosity
(e) compressibility.

65. A liquid would wet the solid, if adhesion forces as compared to cohesion forces are
(a) less
(b) more
(c) equal
(d) less at low temperature and more at high temperature
(e) there is no such criterion.

66. If cohesion between molecules of a fluid is greater than adhesion between fluid and glass, then the free level of fluid in a dipped glass tube will be
(a) higher than the surface of liquid
(b) the same as the surface of liquid
(c) lower than the surface of liquid
(d) unpredictable
(e) none of the above.

67. The point in the immersed body through which the resultant pressure of the liquid may be taken to act is known as
(a) meta center
(b) center of pressure
(c) center of buoyancy
(d) center of gravity
(e) none of the above.

68. The total pressure on the surface of a vertical sluice gate 2 m x 1 m with its top

2 m surface being 0.5 m below the water level will be

(a) 500 kg
(b) 1000 kg
(c) 1500 kg
(d) 2000 kg
(e) 4000 kg.

69. The resultant upward pressure of a fluid on a floating body is equal to the weight of the fluid displaced by the body. This definition is according to
(a) Buoyancy
(b) Equilibrium of a floating body
(c) Archimedes' principle
(d) Bernoulli's theorem
(e) Metacentric principle.

70. The resultant upward pressure of the fluid on an immersed body is called

(a) upthrust
(b) buoyancy
(c) center of pressure
(d) all the above are correct
(e) none of above is correct.

71. The conditions for the stable equilibrium of a floating body are

(a) the meta-center should lie above the center of gravity
(b) the center of buoyancy and the center of gravity must lie on the same vertical line
(c) a righting couple should be formed
(d) all the above are correct
(e) none of the above is correct.

72. Poise is the unit of
(a) surface tension
(b) capillarity
(c) viscosity
(d) shear stress in fluids
(e) buoyancy.

73. Metacentric height is given as the distance between
(a) the center of gravity of the body and the meta center
(b) the center of gravity of the body and the center of buoyancy
(c) the center of gravity of the body and the center of pressure
(d) center of buoyancy and metacenter
(e) none of the above.

74. The buoyancy depends on
(a) mass of liquid displaced
(b) viscosity of the liquid
(c) pressure of the liquid displaced
(d) depth of immersion
(e) none of the above.

75. The center of gravity of the volume of the liquid displaced by an immersed body is called
(a) meta-center
(b) center of pressure
(c) center of buoyancy
(d) center of gravity
(e) none of the above.

76. A piece of metal of specific gravity 13.6 is placed in mercury of specific gravity 13.6, what fraction of it volume is under mercury?
(a) the metal piece will simply float over the mercury
(b) the metal piece will be immersed in mercury by half
(c) whole of the metal piece will be immersed with its top surface just at mercury level
(d) metal piece will sink to the bottom
(e) none of the above.

77. The angle of contact in case of a liquid depends upon
(a) the nature of the liquid and the solid
(b) the material which exists above the free surface of the liquid
(c) both of die above
(d) any one of the above
(e) none of die above.

78. Free surface of a liquid behaves like a sheet and tends to contract to smallest possible area due to the
(a) force of adhesion
(b) force of cohesion
(c) force of friction
(d) force of diffusion
(e) none of die above.

79. Raindrops are spherical because of
(a) viscosity
(b) air resistance
(c) surface tension forces
(d) atmospheric pressure
(e) none of the above.

80. Surface energy per unit area of a surface is numerically equal to ..

(a) atmospheric pressure
(b) surface tension
(c) force of adhesion
(d) force of cohesion
(e) viscosity.

81. The capillary rise at 20°C in a clean glass tube of 1 mm bore containing water is approximately

(a) 1 mm
(b) 5 mm
(c) 10 mm
(d) 20 mm
(e) 30 mm.

82. The difference of pressure between the inside and outside of a liquid drop is

(a) p = Txr
(b) p = T/r
(c) p = T/2r
(d) p = 2T/r
(e) none of the above.

83. If the surface of liquid is convex, men
(a) cohesion pressure is negligible
(b) cohesion pressure is decreased
(c) cohesion pressure is increased
(d) there is no cohesion pressure
(e) none of the above.

84. To avoid vaporisation in the pipeline, the pipe line over the ridge is laid such that it is not more than
(a) 2.4 m above the hydraulic gradient
(b) 6.4 m above the hydraulic gradient
(c) 10.0 m above the hydraulic gradient
(d) 5.0 above the hydraulic gradient
(e) none of the above.

85. To avoid an interruption in the flow of a syphon, an air vessel is provided
(a) at the inlet
(b) at the outlet
(c) at the summit
(d) ay nay point between inlet and outlet
(e) none of the above.

86. The vapour pressure over the concave surface is
(a) less man the vapour pressure over the plane surface
(b) equal to the vapour pressure over the plane surface
(c) greater than the vapour pressure over the plane surface
(d) zero
(e) none of the above.

87. The property by virtue of which a liquid opposes relative motion between its different layers is called
(a) surface tension
(b) co-efficient of viscosity
(c) viscosity
(d) osmosis
(e) cohesion.

88. The process of diffusion of one liquid into the other through a semi-permeable membrane is called
(a) viscosity
(b) osmosis
(c) surface tension
(d) cohesion
(e) diffusivity.

89. The units of dynamic or absolute viscosity are
(a) metres2 per sec
(b) kg sec/meter
(c) newton-sec per meter
(d) newton-sec2 per meter
(e) none of the above.

90. The continuity equation is connected with
(a) viscous/unviscous fluids
(b) compressibility of fluids
(c) conservation of mass
(d) steady/unsteady flow
(e) open channel/pipe flow.

91. The rise or depression of liquid in a tube due to surface tensionwim increase in size of tube will
(a) increase
(b) remain unaffected
(c) may increase or decrease depending on the characteristics of liquid
(d) decrease
(e) unpredictable.

92. Liquids transmit pressure equally in all the directions. This is according to
(a) Boyle's law
(b) Archimedes principle
(c) Pascal's law
(d) Newton's formula
(e) Chezy's equation.

93. Capillary action is due to the
(a) surface tension
(b) cohesion of the liquid
(c) adhesion of the liquid molecules and the molecules on the surface of a solid
(d) all of the above
(e) none of the above.

94. Newton's law of viscosity is a relationship between
(a) shear stress and angular distortion
(b) shear stress and viscosity
(c) shear stress, velocity and viscosity
(d) pressure, velocity and viscosity
(e) shear stress, pressure and rate of angular distortion.

95. The atmospheric pressure with rise in altitude decreases
(a) linearly
(b) first slowly and then steeply
(c) first steeply and then gradually
(d) unpredictable
(e) none of the above.

96. Pressure of the order of 10"' torr can be measured by
(a) Bourdon tube
(b) Pirani Gauge
(c) micro-manometer
(d) ionisastion gauge
(e) McLeod gauge.

97. Operation of McLeod gauge used for low pressure measurement is based on the principle of
(a) gas law
(b) Boyle's law
(c) Charle's law
(d) Pascal's law
(e) McLeod's law.

98. An odd, shaped body weighing 7.5 kg and occupying 0.01 m3 volume will be completely submerged in a fluid having specific gravity of
(a) 1
(b) 1.2
(c) 0.8
(d) 0.75
(e) 1.25.

99. In an isothermal atmosphere, the pressure
(a) decreases linearly with elevation
(b) remains constant
(c) varies in the same way as the density
(d) increases exponentially with elevation
(e) unpredictable.

100. Mercury is often used in barometer because

(a) it is the best liquid

(b) the height of barometer will be less

(c) Its vapour pressure is so low that it may be neglected

(d) both (b) and (c)

(e) it moves easily.

SHORT ANSWER QUESTIONS

1. Define viscosity.

   Viscosity is a property of the fluid by virtue of which it resists shear or angular deformation. Viscosity is occurred due to cohesion force of attraction and molecular momentum transfer.

2. Define Pascal Law and pressure head.

   It states that pressure at point in a static fluid is same in all directions is called pascal law. Pressure head at point is the vertical height of that point from the free surface.

3. What do you mean by hydrostatic force and center of pressure?

   When a stationary fluid meets solid surface either plane or curved, a force is exerted by the fluid on the surface. This force is called total pressure or pressure force or hydrostatic force. Since for a liquid at rest, no tangential force exists, the hydrostatic force acts in the direction normal to the surface. The point of application of total pressure on the surface is called center of pressure (CP).

4. Define fluid Pressure.

   If the fluid is stationary, then the force exerted by the surrounding fluid on the area dA will be perpendicular to the surface dA. If dF is the force acting on dA in normal direction, then intensity of pressure or pressure is given as p=dF/dA

5. Define Absolute pressure.

   The pressure which is measured with reference to absolute vacuum pressure. In other words, it is measured above the absolute zero or complete vacuum.

   Absolute Pressure = Atmospheric Pressure + Gauge pressure

   $$P_{ab} = P_{atm} + P_{gauge}$$

6. What do you mean by manometers and classify it?

   These are used for measuring pressure at a point in a fluid by balancing the column of fluid by the same or another column of fluid. They are classified as:

   Simple manometers
   - Differential manometers

7. Define Steady and Unsteady flow.

   Steady flow: It is defined as that type of flow in which the fluid properties like velocity, pressure, density etc. at a point do not change with time.

   Mathematically, for steady flow

   $$\frac{\partial v}{\partial t} = 0 \qquad \frac{\partial p}{\partial t} = 0 \qquad \frac{\partial \rho}{\partial t} = 0$$

   Example: Flow of an incompressible fluid (i.e., liquids) through a pipeline

   Unsteady flow: It is defined as that type of flow in which the fluid properties like velocity, pressure, density etc. at a point change with time.

   Mathematically, for steady flow

$\frac{\partial v}{\partial t} \neq 0 \qquad \frac{\partial p}{\partial t} \neq 0 \qquad \frac{\partial \rho}{\partial t} \neq 0$

Example: Flow of compressible fluid (i.e., gas) through a pipeline

The flow in a pipe whose valve is being opened or closed gradually.

8. Define uniform and non-uniform flow.

Uniform flow: It is defined as that type of flow in which the velocity of flow of a fluid is constant at any section in the path of flow of the fluid. Mathematically, for uniform flow

$$\left(\frac{\partial v}{\partial s}\right)_{t=constant} = 0$$

where ∂v=change of velocity

∂s= Displacement in any direction

Example: Flow of a liquid through a pipeline of uniform diameter.

Non-Uniform flow: It is defined as that type of flow in which the velocity of flow of a fluid is different at different sections in the path of flow of the fluid. Mathematically, for Non- uniform flow

$$\left(\frac{\partial v}{\partial s}\right)_{t=constant} \neq 0$$

Example: Flow of a liquid through a pipeline of variable diameter.

9. Define laminar flow.

Laminar flow: A flow is said to be laminar if each particle fluid has a definite path and the path of one particle does not cross the path of any other particle.

Laminar flow is also called streamline or viscous flow. Such a flow can occur only when the velocity of flow is low.

Example: Ground water flows, Flow of blood in veins and arteries, flow of muddy water at a very low velocity through a pipeline, flow through a capillary tube.

10. Define Turbulent flow.

Turbulent flow: A flow is said to be turbulent if the fluid particle does not have a definite path and the path of one particle crosses the path of other particles during flow. In turbulent flow the fluid particles move in a zig-zag way. Turbulent flow is also called non-laminar flow. This type of flow occurs when the velocity of flow is high.

Example: Flow of a liquid of low viscosity such as petrol through a pipeline.

11. Define Rotational and Irrotational flows.

Rotational flows: Fluid particles rotate about their mass centre while moving in the direction of flow. This flow is called rotational flow. Example: Forced vortex, earth.

Irrotational flows: The fluid particles do not rotate about their mass centre while moving in the direction of flow. This flow is called irrotational flow. Example: Free vortex, satellite, whirlpool in a river.

12. Define Impulse Momentum Principle.

The impulse-momentum theorem states that the change in momentum of an object equals the impulse applied to it. The impulse-momentum theorem is logically equivalent to Newton's second law of motion (the force law).

From Newton's 2nd Law: $F = m\, a = m\,(V_1 - V_2) / t$

Impulse of a force is given by the change in momentum caused by the force on the body.

Ft = Impulse= $mV_1 - mV_2$ = Initial Momentum – Final Momentum

Force exerted by jet on the plate in the direction of jet, $F = m\,(V_1 - V_2) / t$

= (Mass / Time) (Initial Velocity – Final Velocity)
$= (\rho Q)\,(V_1 - V_2) = (\rho a V)\,(V_1 - V_2)$

13. Define hydraulic machines.

Hydraulic machines which convert the energy of flowing water into mechanical energy

14. Give example for a low head, medium head, and high head turbine.

Low head turbine – Kaplan turbine, Medium head turbine – Modern Francis turbine, and High head turbine – Pelton wheel

15. What is impulse turbine? Give example.

In impulse turbine all the energy converted into kinetic energy. From these the turbine will develop high kinetic energy power. This turbine is called impulse turbine. Example: Pelton turbine

16. What is reaction turbine? Give example.

In a reaction turbine, the runner utilizes both potential and kinetic energies. Here portion of potential energy is converted into kinetic energy before entering the turbine. Example: Francis and Kaplan turbine.

17. What is axial flow turbine?

In axial flow turbine water flows parallel to the axis of the turbine shaft. Example: Kaplan turbine

18. What is mixed flow turbine?

In mixed flow water enters the blades radially and comes out axially, parallel to the turbine shaft. Example: Modern Francis turbine.

19. What is the function of spear and nozzle?

The nozzle is used to convert whole hydraulic energy into kinetic energy. Thus the nozzle delivers high speed jet. To regulate the water flow through the nozzle and to obtain a good jet of water spear or nozzle is arranged.

20. Define gross head and net or effective head.

Gross Head: The gross head is the difference between the water level at the reservoir and the level at the tailstock.

Effective Head: The head available at the inlet of the turbine.

21. Define hydraulic efficiency.

It is defined as the ratio of power developed by the runner to the power supplied by the water jet.

22. Define mechanical efficiency.

It is defined as the ratio of power available at the turbine shaft to the power developed by the turbine runner.

23. Define volumetric efficiency.

It is defined as the volume of water striking the buckets to the total water supplied by the jet.

24. Define overall efficiency.

It is defined as the ratio of power available at the turbine shaft to the power available from the water jet.

25. What is meant by Pump?

A pump is device which converts mechanical energy into hydraulic energy.

26. Mention main components of Centrifugal pump.

i) Impeller ii) Casing

iii) Suction pipe, strainer & Foot valve iv) Delivery pipe & Delivery valve

27. What is meant by Priming?

The delivery valve is closed, and the suction pipe, casing, and portion of the delivery pipe up to delivery valve are filled with the liquid so that no air pocket is left. This is called as priming.

28. Define Manometric head.

It is the head against which a centrifugal pump work.

29. Define Mechanical efficiency.

It is defined as the ratio of the power delivered by the impeller to the power supplied to the shaft.

30. Define speed ratio, flow ratio.

Speed ratio: It is the ratio of peripheral speed at outlet to the theoretical velocity of jet corresponding to manometric head.

Flow ratio: It is the ratio of the velocity of flow at exit to the theoretical velocity of jet corresponding to manometric head.

31. Mention main components of Reciprocating pump.

- Piton or Plunger
- Suction and delivery pipe
- Crank and Connecting rod

32. Define Slip of reciprocating pump? When does the negative slip occur?

The difference between the theoretical discharge and actual discharge is called slip of the pump. But in sometimes actual discharge may be higher than theoretical discharge, in such a case coefficient of discharge is greater than unity and the slip will be negative called as negative slip.

33. What is indicator diagram?

Indicator diagram is nothing, but a graph plotted between the pressure head in the cylinder and the distance traveled by the piston from inner dead center for one complete revolution of the crank.

34. What do you mean by Hydraulic Accumulator?

It is a device used for storing the energy of a liquid in the form of pressure energy, which may be supplied for any sudden or intermittent requirement. It can be used in case of hydraulic lift or crane. When the ram is at lowermost position, the pump supplies water under pressure and it raises the ram on which a heavy weight is placed. When the ram is at the upper most position, the cylinder is full of water and accumulator has stored the maximum amount of pressure energy. When the machine requires a large amount of pressure energy the hydraulic accumulator will supply this energy and ram will move in downward direction.

35. What do you mean by Hydraulic Intensifier?

This device is used to increase intensity of pressure of water by means of hydraulic energy available from a large amount of water at a low pressure. Such devices are used when hydraulic machines, like hydraulic press requires water at high pressure which cannot be obtained from the main supply directly. It consists of a fixed ram through which the water under high pressure, flows to the machine. A hollow inverted cylinder, containing water under high pressure, is mounted over the fixed ram.

DESCRIPTIVE TYPE QUESTIONS

1. Derive the expression for pressure variation in a static fluid.
2. If a liquid has a dynamic viscosity of 0.05 poise and kinematic viscosity of 0.14 stokes, calculate its specific gravity. (1 stoke = 1 cm^2/sec).
3. Find out the pressure in bar at a point located at a depth of 5 m from free surface in a tub full of water. The atmospheric pressure is 101324 N/m^2. Take density of water as 1000 kg/m^3.
4. A simple manometer is used to measure the pressure of oil (sp. Gr. 0.8) flowing in a pipeline. Its right limb is open to atmosphere while left limb is connected to pipe. The center of pipe is 9 cm below the level of Hg (sp. Gr. 13.6) in the right limb. If the difference in the levels of Hg I two limbs is 15 cm, determine the absolute pressure of the oil in the pipe.
5. A u-tube differential manometer connects two pipes A and B. Pipe A contains a fluid with sp.gr. 1.594 under a pressure of 11.772 N/cm^2 and pipe B contains oil of sp.gr. 0.8 under a pressure of 11.772 N/cm^2. The pipe A lies 2.5 m above pipe B. Find the difference in pressure measured by Hg as fluid filling the u-tube.
6. A rectangular plane surface is 2m wide and 3 m deep. It lies in vertical plane in water. Determine the total pressure and position of center of pressure on the plane surface when its upper edge is horizontal and (a) coincides with free surface of water. (b) 2.5 m below the free surface of water.
7. Determine the total pressure on a circular plate of diameter 1.5 m which is placed vertically in water in such a way that the center of plate is 3m below the free surface of water. Find the position of center of pressure.
8. Find out the pressure force exerted on an equilateral triangle having 2 m side, when placed horizontally in a swimming pool such that its one corner is 3 m below the free surface. Also find out the depth of center of pressure.
9. Derive the expression for Continuity equation.
10. Write the Bernoulli's equation with its assumptions and state all types of energy heads.
11. An orifice meter with orifice diameter 10 cm is inserted in a pipe of 20 cm diameter. The pressure gauges fitted upstream and downstream of the orifice meter give reading of 19.26 N/cm^2 and 9.81N/cm^2 respectively. Co-efficient of discharge for the meter is given as 0.6. Find the discharge of water through pipe.
12. A horizontal venturimeter with inlet and throat diameters 20 cm and 10 cm respectively is used to measure the flow of oil of specific gravity 0.8. The discharge of oil through venturimeter is 60litres/sec. find the reading of the oil -mercury differential manometer. Take Cd=0.98
13. Find the velocity of flow of an oil through a pipe, when the difference of mercury level in a differential U- tube manometer connected to the two tappings of the pitot-

tube is 200mm. Take coefficient of pitot tube 0.98 and sp. gr. of oil =0.8.

14. Find the force exerted by a jet of water of diameter 100 mm on a stationary flat plate, when the jet strikes the plate normally with a velocity of 30 m/s.
15. A jet of water of diameter 100 mm moving with a velocity of 30m/s strikes a curved fixed symmetrical plate at the center. Find the force exerted by the jet of water in the direction of the jet, if the jet is deflected through an angle of 120˚ at the outlet of the curved plate.
16. Classify various types of turbines based on head, specific speed, energy at inlet, direction of flow, and name of the originator.
17. Describe the construction and working of Pelton turbine with suitable diagram.
18. Describe the construction and working of Francis and Kaplan turbine with suitable diagram.
19. Obtain an expression for the work done per second by water on the runner of a – Pelton wheel. Hence derive an expression for maximum efficiency of the Pelton wheel giving the relationship between the jet speed and bucket speed.
20. Draw a neat sketch of centrifugal pump and explain the working principle of the centrifugal pump.
21. Draw a neat sketch of Reciprocating pump and explain the working principle of single acing and double acting Reciprocating pump.
22. The diameter and stroke of a single acting reciprocating pump are 200 mm and 400 mm respectively, the pump runs at 60 rpm and lifts 12 liters of water per second through a height of 25 m. The delivery pipe is 20m long and 150mm in diameter. Find (i) Theoretical power required to run the pump (ii) Percentage of slip. (iii) Acceleration head at the beginning and middle of the delivery stroke.
23. Explain the principle, construction and working of the hydraulic Ram along with its neat sketch. Also, write the applications of hydraulic Ram.
24. Explain the principle, construction and working of the hydraulic Intensifier along with its neat sketch. Also, write the applications of hydraulic Intensifier.
25. Explain the principle, construction and working of the hydraulic jack along with its neat sketch. Also, write the applications of hydraulic jack.