#### TWO MARK QUESTIONS AND ANSWERS

**1. Define fluid mechanics.**

It is the branch of science, which deals with the behavior of the fluids (liquids or gases) at rest as well as in motion.

**2. Define Mass Density.**

Mass Density or Densityisdefined as ratio of mass of the fluid to its volume (V)

Density of water = 1 gm/cm3 or 1000 kg / m3.



**3. Define Specific Weight.**

It is the ratio between weight of a fluid to its volume.





Unit: N / m3

**4. Define Viscosity.**

Viscosity is defined as the property of fluid, which offers resistance to the movement of one layer of fluid over another adjacent layer of fluid.

This shear stress is proportional to the rate of change of velocity.



 Coefficient of dynamic viscosity (or) only viscosity

du / dy = rate of shear strain

**5. Define Specific Volume.**

Volume per unit mass of a fluid is called specific volume



  Unit: m3 / kg.

**6. Define Specific Gravity.**

Specific gravity is the ratio of the weight density or density of a fluid to the weight density or density of standard fluid. It is also called as relative density.

Unit : Dimension less. Denoted as: ‘S’





**7. Calculate the specific weight, density and specific gravity of 1 litre of liquid which weighs 7 N.**

Solution:

Given 

W = 7 N

1. Sp. Weight (w) 

ii Density (p) 

iii. Sp. Gravity (S)  (Density of water = 1000 kg / m3)

S = 0.7135

**8. State Newton’s Law of Viscosity.**

It states that the shear stress () on a fluid element layer is directly proportional to the rate of shear strain. The constant of proportionality is called the co-efficient of viscosity



**9. Name the Types of fluids.**

1. Ideal fluid
2. Real fluid
3. Newtonian fluid
4. Non-Newtonian fluid.
5. Ideal plastic fluid

**10. Define Kinematic Viscosity.**

It is defined as the ratio between the dynamic viscosity and density of fluid.

  Represented as 

  Unit: m2 / sec.



Centistoke means 

**11. Find the Kinematic viscosity of an oil having density 981 kg/m. The shear stress at a point in oil is 0.2452 N/m2 and velocity gradient at that point is 0.2 /sec.**

Mass density p = 981 kg/m3, Shear stress 

  Velocity gradient 







12. Determine the specific gravity of a fluid having viscosity 0.05 poise and Kinematic viscosity 0.035 stokes.

**Given:** Viscosity, μ = 0.05 poise = (0.05 / 10) Ns / m2.

Kinematic viscosity ν = 0.035 stokes = 0.035 cm2 / s

= 0.035 x 10-4 m2 / s





Density of liquid 1428.5

Specific gravity of liquid = = = 1.428 = 1.43

Density of water 1000

**13. Define Compressibility.**

Compressibility is the reciprocal of the bulk modulus of elasticity, K which is defined as the ratio of compressive stress to volumetric strain.

Consider a cylinder filled with a piston as shown





V → Volume of gas enclosed in the cylinder

P → Pressure of gas when volume is 

Increase in pressure = dp kgf / m2

Decrease of volume = 

* Volumetric strain 

- Ve sign → Volume decreases with increase in pressure

* Bulk modulus  



**14. Define Surface Tension.**

Surface tension is defined as the tensile force acting on the surface of a liquid in contact with a gas or on the surface between two immiscible liquids such that the contact surface behaves like a membrance under tension.

Unit: N / m.

**15. Define** **Capillarity:**

Capillary is defined as a phenomenon of rise of a liquid surface is a small tube relative to adjacent general level of liquid when the tube is held vertically in the liquid. The resistance of liquid surface is known as capillary rise while the fall of the liquid surface is known as capillary depression. It is expressed in terms of cm or mm of liquid.

**16. The Capillary rise in the glass tube is not to exceed 0.2 mm of water. Determine its minimum size, given that surface tension of water in contact with air = 0.0725 N/m**

 Solution:

Capillary rise, h = 0.2 mm = 0.2 x 103 m

 Surface tension 

  Let, Diameter of tube = d

Angel θ for water = 0

Density for water = 1000 kg / m2





Minimum  of the tube = 14.8 cm.

**17. Find out the minimum size of glass tube that can be used to measure water level if the capillary rise in the tube is to be restricted to 2mm. Consider surface tension of water in contact with air as 0.073575 N/m.**

  Solution:

Capillary rise h = 2.0 mm = 

Let, diameter = d

Density of water = 1000 kg / m3



Angle for water 



d = 0.015 m = 1.5 cm.

Thus the minimum diameter of the tube should be 1.5 cm.

**18. Define Real fluid and Ideal fluid.**

**Real Fluid:**

A fluid, which possesses viscosity, is known as real fluid. All fluids, in actual practice, are real fluids.

**Ideal Fluid:**

A fluid, which is incompressible and is having no viscosity, is known as an ideal fluid. Ideal fluid is only an imaginary fluid as all the fluids, which exist, have some viscosity.

**19. Write down the expression for capillary fall.**

Height of depression in tube 

Where,

h = height of depression in tube.

d = diameter of the

σ = surface tension

ρ = density of the liquid.

θ = Angle of contact between liquid and gas.

20. Two horizontal plates are placed 1.25 cm apart. The space between them being filled with oil of viscosity 14 poises. Calculate the shear stress in oil if upper plate is moved with a velocity of 2.5 m/s.

Solution:

**Given:**

Distance between the plates, dy = 1.25 cm = 0.0125m.

Viscosity μ = 14 poise = 14 / 10 Ns / m2

Velocity of upper plate, u = 2.5 m/Sec.

Shear stress is given by equation as τ = μ (du / dy).

Where du = change of velocity between the plates = u – 0 = u = 2.5 m/sec.

dy = 0.0125m.

τ = (14 /10) X (2.5 / 0.0125) = 280 N/m2.

**21. Write down the types of fluid flow.**

The fluid flow is classified as :

1. Steady and Unsteady flows.
2. Uniform and Non – uniform flows.
3. Laminar and turbulent flows.
4. Compressible and incompressible flows.
5. Rotational and irrotational flows
6. One, two and three dimensional flows.

**22. Write a short notes on “Laminar flow”.**

Laminar flow is defined as that type of flow in which the fluid particles move along well – defined paths or stream line and all the stream lines are straight and parallel. Thus the particles move in laminas or layers gliding over the adjacent layer. This type of flow is also called stream – line flow or viscous flow/

**23. Define “Turbulent flow”.**

Turbulent flow is that type of flow in which the fluid particles move in a zig –zag way. Due to the movement of fluid particles in a zig – zag way.

**24. What is mean by Rate flow or Discharge?**

It is defined as the quantity of a fluid flowing per second through a section of a pipe or channel. For an incompressible fluid( or liquid) the rate of flow or discharge is expressed as volume of fluid flowing across the section per section. For compressible fluids, the rate of flow is usually expressed as the weight of fluid flowing across the section.

The discharge (Q) = A X V

Where, A = Cross – sectional area of pipe.

V = Average velocity of fluid across the section.

**25. What do you understand by Continuity Equation?**

The equation based on the principle of conservation of mass is called continuity equation. Thus for a fluid flowing through the pipe at all the cross-section, the quantity of fluid per second is constant.

A1V1 = A2V2..

**25. The diameters of a pipe at the sections 1 and 2 are 10 cm and 15 cm respectively. Find the discharge through the pipe if the velocity of water flowing through the pipe section 1 is 5 m/s. determine also the velocity at section 2.**

**Solution. Given:**

**At section 1.** D1 = 10 cm = 0.1 m.

A1 = (π / 4) X D12 = (π / 4) X (0.1)2 = 0.007854 m2.

V1 = 5 m/s.

**At section 2.** D2 = 15 cm = 0.15 m.

A2 = (π / 4) X(0.15)2 = 0.01767 m2.

1. Discharge through pipe is given by equation

Q = A1 X V1

= 0.007544 X 5 = 0.03927 m3/ s.

using equation, We have A1V1 = A2V2..

V2 = ( A1V1 / A1) = ( 0.007854 /0.01767) X 5 = 2.22 m/s.

**26. What are the assumptions made in the derivation of Bernoulli’s equation?**

(i). The fluid is ideal, i.e., Viscosity is zero. (ii). The flow is steady

(iii). Te flow water is incompressible. (iv). The flow is irrotational.

**27. State the Bernoulli’s theorem for steady flow of an incompressible fluid.**

It states that in a steady , ideal flow of an incompressible fluid, the total enrgy at any point is constant. The total energy consists of pressure energy or datum energy. These energies per unit weight of the fluid are:

Pressure Energy = p / ρg

Kinetic energy = v2 / 2g

Datum Energy = z

The mathematically, Bernoulli’s theorem is written as

(p/w) + (v2 / 2g) + z = Constant.

**28. Define Venturi meter.**

Venture meter is an device used for measuring the rate of flow of a fluid flowing through a pipe. It consists of three pats (i). A short converging part (ii) Throat and (iii). Diverging part.

**29. Define Pitot – tube.**

Pitot tube is a device used for measuring the velocity of flow at any point in a pipe or channel. It is based on the principle that if the velocity of flow at a point becomes zero.

**30. What is mean by Free liquid jet?**

Free of liquid jet is defined as the jet of water coming out from the nozzle in atmosphere. The path traveled by the free jet is parabolic.

**31. Write down the formulae for finding the discharge in venture meter or Orifice meter.**

Q = Cd 

Where a1 = area of the inlet Venturi meter.

a2 = area at the throat

Cd = co-efficient of venture meter.

h = difference of pressure head in terms of fluid head flowing through venture meter

**32. What is mean by dynamics of fluid flow?.**

The study of fluid motion with the forces causing flow is called dynamics of fluid flow., which is analyzed by the Newton’s second law of motion.

**33. What is the difference between venturimeter and orifice meter?**

1. The venturimeter can be used for measuring the flow rates of all compressible flows.

2. Venturimeter is installed in pipeline only, and the accelerated flow through the apparatus, is subsequently decelerated to the original velocity at the outlet of the venturimeter. The flow continues through the pipe line. In the orifice meter the entire potential energy of fluid is converted to kinetic energy and the jet discharges freely into the atmosphere.

**34. Why is coefficient of discharge of orifice meter much smaller than that of venturimeter?**

The coefficient of discharge for an orifice meter is much smaller than that of for a venturimeter. This is because in the case of an orifice meter there are no gradual converging and diverging flow passages as in the case of a venturimeter, which results in a greater loss of energy and consequent reduction of the coefficient of discharge for an orifice meter.