

FLUID MECHANICS AND MACHINERY

2 MARKS QUESTIONS AND ANSWER

1. Define fluids.

Fluid may be defined as a substance which is capable of flowing. It has no definite shape of its own, but conforms to the shape of the containing vessel.

2. Explain the variation of viscosity with temperature.

For liquids viscosity inversely vary with the temperature and for gases the viscosity varies directly with the temperature.

3. What is momentum equation?

It is based on the law of conservation of momentum or on the momentum principle. It states that, the net force acting on a fluid mass is equal to the change in momentum of flow per unit time in that direction.

4. What are the properties of real fluid?

- a. It is compressible
- b. They are viscous in nature
- c. Shear force exists always in such fluid.

5. Difference between hydraulic Gradient line and Energy Gradient line.

Hydraulic gradient line: - Hydraulic gradient line is defined as the line which gives the sum of pressure head and datum head of a flowing fluid in a pipe with respect to the reference line.

Total energy line: - Total energy line is defined as the line which gives the sum of pressure head, datum head and kinetic head of a flowing fluid in a pipe with respect to some reference line.

6. What is the expression for head loss due to friction in Darcy formula?

$$h_f = 4fLV^2 / 2gd$$

Where f = Coefficient of friction in pipe, L = Length of the pipe

d = Diameter of pipe and V = velocity of the fluid

7. Define Moody diagram

It is a graph in non-dimensional form that relates the Darcy friction factor, Reynolds number and relative roughness for fully developed flow in a circular pipe.

8. Define dimensional homogeneity.

The dimensions of each term in an equation on both sides are equal. Thus if the dimensions of each term on both sides of an equation are the same the equation is known as dimensionally homogeneous equation.

9. Derive the expression for Reynold's number.

It is the ratio between inertia forces to the viscous force.

$$Re = \rho v D / \mu$$

10. State the Buckingham's π theorem.

If there are n variables (dependent and independent) in a physical phenomenon and if these variables contain m fundamental dimensions, then these variables are arranged i to (n-m) dimensionless terms called Pi terms.

11. Name the different forces present in fluid flow.

Inertia force, viscous force, Surface tension force, pressure force, elastic force and Gravity force.

12. What are the similarities between model and prototype?

- a. Geometric Similarity
- b. Kinematic Similarity
- c. Dynamic Similarity

13. Define a centrifugal pump.

If the mechanical energy is converted into pressure energy by means of centrifugal force cutting on the fluid, the hydraulic machine is called centrifugal pump.

14. What is meant by Cavitation's?

It is defined phenomenon of formation of vapor bubbles of a flowing liquid in a region where the pressure of the liquid falls below its vapor pressure and the sudden collapsing of these vapor bubbles in a region of high pressure.

15. Mention main components of Reciprocating pump.

Piston or Plunger, Suction and delivery pipe, Crank and Connecting rod.

16. How are hydraulic turbine classified.

- a. According to the type of energy
- b. According to the direction of flow
- c. According to the head at inlet
- d. According to the specific speed of the turbine

17. List the important characteristic curves of a turbine.

Main characteristics curves or Constant head curves

Operating characteristic curves or Constant speed curves

Constant efficiency curves

16 MARKS QUESTIONS

- (a) What are the types of fluids and explain each type?

(b) Define about compressibility, surface tension, capillarity and vapour pressure.
- (a) Derive the Darcy-Weisbach equation for the loss of head due to friction in pipes.

(b) Explain the Reynold's Experiment with diagram.
- The velocity profile of a viscous fluid over a plate is parabolic with vertex 20cm from the plate, where the velocity is 120 cm/s. Calculate the velocity gradient and shear stress at distance of 0, 5 and 15cm from the plate, given the viscosity of the fluid is 6 poise.
- Two tanks are connected with the help of two pipes in series. The lengths of the pipes are 1000m and 800m whereas the diameters are 400mm and 200mm respectively. The coefficient of friction for both the pipes is 0.008. The difference of water level in the tanks is 15m. Find the rate of flow of water through the pipes, considering all losses. Also draw the total energy line and hydraulic gradient lines for the system.
- Explain about the types dimensionless numbers of a flowing fluid.
- Find the momentum thickness and energy thickness for the velocity distribution in the boundary layer given by $\frac{u}{U} = 2\left(\frac{y}{\delta}\right) - \left(\frac{y}{\delta}\right)^2$.
- (i) Write the types of impact jets are there.

(ii) Define centrifugal pumps and explain the main parts of a centrifugal pump with figures.
- Explain about working and various component of pelton turbine with diagram.