CE3301 FLUID MECHANICS

Important Questions

UNIT- I FLUIDS PROPERTIES AND FLUID STATICS

2-Mark

1. State Newton's law of viscosity.
2. Define Mass Density.
3. Define Specific volume of a fluid and write its unit.
4. Name the devices that are used to measure the pressure of a fluid.
5. Define compressibility of a fluid.
6. State Pascal's law.
7. Define total pressure on a surface and centre of pressure of a surface.
8. Classify the types of fluids and give some examples for the real fluids.
9. What is cohesion and adhesion in fluids?
10. Distinguish between dynamic viscosity and kinematic viscosity
11. Write down the units for i) density, ii) viscosity.
12. Relate the terms absolute pressure, gauge pressure and vacuum pressure.
13. Distinguish between a real fluid and an ideal fluid.
14. Differentiate between specific weight and specific gravity of an oil.
15. Briefly explain the term centre of buoyancy.
16. Differentiate solid and fluid.
17. Calculate the height of capillary rise for water in a glass tube of diameter 1 mm.
18. Distinguish between gauge pressure and vacuum pressure.
19. Two horizontal plates are placed 1.25 cm apart. The space between them is being filled with oil of viscosity 14 poises. Examine the shear stress in oil if upper plate is moved with a velocity of 2.5 mis.
20. Find the Kinematic viscosity of an oil having density 981 kg/m3. The shearstressatapointinoilis0.2452N/m2 and velocity gradient at that point is 0.2 /sec.

21. Determine the specific gravity of a fluid having viscosity 0.00 Ns/m2 and kinematic viscosity 0.035 x 10-4m2/s.

22. 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
23. Determine the specific gravity of a fluid having viscosity 0.05 Poise and kinematic viscosity 0.035 stokes.
24. Write the expression for capillary fall in terms of surface tension for mercury.
25. Temperature rise, decreases viscosity in liquids but increases in gases, why?

13 – Mark

1. Find the density of a metallic body which floats at the interface of mercury of sp.gr. 13.6 and water such that 40% of its volume is sub – merged in mercury and 60% in water.
2. Two large plane surfaces are 2.4 cm apart. The space between the gap is filled with glycerin. What force is required to drag a thin plate of size 0.5 m between two large plane surfaces at a speed of 0.6 m/sec. if the thin plate is a) In the middle gap b) Thin plate is 0.8 cm from one of the plane surfaces? Take dynamic viscosity of fluid is 8.1 poise.

UNIT – II BASIC CONCEPTS OF FLUID FLOW

2 - Mark

1. Define equipotential line.
2. State Bernoulli's theorem.
3. What are the types of fluid flows?
4. Define flow net.

5. Define Stream function.
6. What is meant by velocity potential function?
7. Differentiate compressible and incompressible flow.
8. what are the assumptions made in the derivation of Bernoulli's Equation? State its applications.
9. What are the types of motion of fluid particle?
10. Define rate of flow.
11. Classify the types of Motion
12. Explain the impulse momentum principle.
13. Compare Laminar flow and turbulent flow.
14. Write and infer the equations of motion.
15. Distinguish between steady flow and unsteady flow
16. Name the different forces present in a fluid flow. For the Euler's equation of motion, what are all the forces taken into consideration?
17. Write the properties of stream function.
18. Give an expression for the rate of flow through venturi meter.
19. Distinguish between stream line and streak line
20. Distinguish between uniform and non-uniform flow
21. What do you understand by Continuity Equation?
22. A pitot - static tube is used to measure the velocity of water in a pipe. The stagnation pressure head is 6mm and static pressure head is 5m. Calculate the velocity of flow assuming the co-efficient of tube equal to 0.98.
23. Can there be flow across a streamline? why?
24. Write the expression for the resultant force acting between two sections of the pipe in terms of discharge using impulse-momentum principle.
25. Give the relation between stream function and velocity potential function

13 - Mark

1. Water flows through a pipe AB 1.2 diameter at 3m/'s and then passes through a pipe BC 1.5m diameter. At C, the pipe branches. Branch CD is 0.8m in diameter
2. If the Velocity distribution of a fluid over a plate is given by u = ay2+by+c with a vertex 0.2m from the plate, where the velocity is 1.2 m/s. Calculate the velocity gradient and shear stress at a distance of 0m 0.1m 0.2m from the plate. If the viscosity of the fluid is 0.85 Ns/m2.
3. State Bernoulli's theorem for steady flow of a incompressible third. Derive an expression for Bernoulli's equation from first principle and state the assumption made for such a derivation

UNIT - III DIMENSIONAL ANALYSIS AND MODEL STADIES

2 - Mark

1. State the Buckingham's pi-theorem.
2. Distinguish between Geometric similarity and Kinematic similarity.
3. List the steps in determining the i groups
4. Check whether the equation V = v2gH, is dimensionally homogenous?
5. Classify the methods of dimensional analysis.
6. What is meant by Similitude and mention its types
7. Write the dimensions of the following quantities:
   a. Velocity b. Dynamic viscosity
8. Write short note on Dynamic similarity
9. Explain about model and model analysis.
10. Define dimensionless numbers and list any two dimensionless numbers.
11. Illustrate any three demerits of a distorted model.
12. Write two examples of a fluid flow situation where Froude model law is applied.
13. Differentiate between model and prototype.
14. Define the term dimensional homogeneity.

15. Define Reynold's number
16. Name the similarity laws and identify its significance.
17. How the fundamental quantities are involved in the dimensional analysis?
18. Write short note on distorted model and undistorted model.
19. What is meant by Froude number?
20. Explain the applications of model testing
21. State Mach's model law.
22. List various model laws applied in model analysis
23. Write the dimensions for the following 1) Mass density 2) Force.
24. What do you infer from primary and derived quantities?
25. Define scale ratio. Evaluate scale ratio for area.

13 - Mark

1. State and explain about the Buckingham's pi-theorem.
2. Check the dimensional homogeneity of the following common equations In the field of hydraulics. a) Q = Cd. a. V2gH b) V = C$\sqrt{mi}$
3. What is a distorted model? How it differs from an undistorted model. Discuss the advantages and disadvantages of distorted models
4. velocity at P (3,4). Also, the velocity potential function ϕ.

UNIT – IV INCOMPRESSIBLE VISCOUS FLOW

2 - Mark

1. Name the characteristics of laminar flow.
2. Describe the factors to be determined when viscous fluid flows through the circular pipe.
3. Define H.G.L
4. Define Reynolds number

5. Define the term "Vena Contract".
6. Define a) pipes in series b) pipes in parallel?
7. Differentiate Major and Minor headloss
8. Predict the head lost due to friction in a pipe of diameter 300 mm and length 50m, through which water is flowing at a velocity of 3 m/s. Take kinematic viscosity of water is 0.01 stoke.
9. Differentiate laminar and turbulent flow.
10. Describe Darcy formula. How will you interpret the loss of head due to friction in pipes?
11. Using Hagen Poisuille's derivation, show the formula for average velocity and velocity distribution.
12. Illustrate the expression for drop of pressure for a given length of a pipe.
13. Relate an expression for co efficient of friction in terms of shear stress.
14. Compare hydraulic gradient line with total energy line
15. Explain the significance of Moody diagram.
16. Explain the terms a) major energy loss, b) minor energy loss.
17. Formulate Hagen Poisuille's equation.
18. Formulate an expression for loss of head due to sudden enlargement and sudden contraction of the pipes
19. Summarize the properties of pipe roughness
20. Draw and assess the shear stress and velocity distribution diagram for the viscous flow in a circular conduit.
21. What are the fluid machines or hydraulics?
22. Define gross head of the turbine
23. What are the efficiencies of a turbine?
24. Define impulse and reaction turbine
25. Classification of hydraulic machines

13 - Mark

1. An oil of Sp. Gr 0.9 and viscosity 0.06 poise is flowing through a pipe of diameter 200 mm at the rate of 60 liters/sec. Identify the head lost due to friction for a 500m length of pipe. Also identify the power required to maintain this flow.
2. The stream function for a dimensional flow is given by Ψ =2xy. Calculate the resultant

UNIT – V BOUNDARY LAYERS

2 – Mark

1. List out the methods of preventing the separation of a Boundary layer.
2. List out the assumptions made in the analysis of boundary layer development.
3. Describe the term Laminar Sub - layer?
4. Define boundary layer thickness
5. List out the conditions for separation of boundary layer.
6. Define energy thickness.
7. Differentiate displacement thickness and energy thickness.
8. Differentiate between Laminar boundary layer and turbulent boundary layer.
9. Distinguish between local co-efficient of drag and average co-efficient of drag.
10. Discuss about the applications of Von Karman momentum integral equation.
11. Illustrate the term "Boundary Layer".
12. Illustrate the terms: Drag and Lift.
13. Illustrate the examples of formation of boundary layer in day to day life.
14. Explain the diagram for drag force on a plate due to boundary layer.
15. Infer how the drag and lift acting on a body moving in a fluid of density p at a uniform velocity U are calculated mathematically.
16. Explain the Boundary layer theory

17. Generalize the drag force from a lift force?
18. Formulate the values of boundary layer thickness and drag co - efficient for Blasius's solution.
19. Assess the Von Karman momentum integral equation.
20. Recommend the boundary conditions for the velocity profiles.
21. What is the work done by reciprocating pump per second.
22. Define slip and % slip.
23. Define Laminar boundary layer
24. Define transition zone
25. Define kinetic energy correction factor

13 - Mark

1. For the velocity profile for laminar boundary layer w/U = (3/2) (y/δ) - (1/2) (y/δ)3. Identify the boundary layer thickness, shear stress, drag force and coefficient of drag in terms of Reynolds Number.
2. Air is flowing over a flat plate 500 mm long and 600 mm wide with a velocity of 4m/s. The kinematic viscosity of air is given as 0.15 x 10-4 m2/s. Identify i) the boundary layer thickness at the end of the plate, ii) shear stress at 200 mm from