CBCS SCHEME

USN

17AU42

Fourth Semester B.E. Degree Examination, June/July 2019
Fluids Mechanics

Time: 3 hrs. Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. Define the following fluid properties :
i) Density
ii) Specific weight
iii) Specific volume
iv) Specific gravity
v) Viscosity. **(10 Marks)**

b. two horizontal plates are placed 1.25cm apart, the space between them being filled with oil of viscosity 14 poses calculate the shear stress in oil if upper plate is moved with a velocity of 2.5c/S. **(06 Marks)**

c. A liquid bubble of 2cm radius has a internal pressure of 12.95 pascals. Determine the surface tension of liquid film. **(04 Marks)**

OR

2 a. State and prove Pascal's Law. **(08 Marks)**

b. What is total pressure and centre of pressure? **(04 Marks)**

c. Determine the total pressure n a circular plate of diameter 1.5m which is placed vertically in water on such a way that the centre of the plate is 3m below the free surface of water. Find the position of centre of pressure also. **(08 Marks)**

Module-2

3 a. Define the following :
i) Buoyancy
ii) Centre of buoyancy
iii) Meta centre
iv) Meta centric height. **(10 Marks)**

b. A block of word of specific gravity 0.7 floats in water. Determine the meta centric height of the block if its size is 2m × 1m × 0.8m. **(10 Marks)**

OR

4 a. Obtain an expression for continuity equation for a three dimensional flow. **(08 marks)**

b. Explain the terms :
i) Steady flow and unsteady flow
ii) Uniform and non uniform flow. **(04 Marks)**

c. The velocity components in a flow are given by u = 6y and v = –6x. Find whether the flow is possible and stream function ψ. **(08 Marks)**

Module-3

5 a. Derive Bernoulli's equation from Euler's equation with assumptions and limitations. **(08 Marks)**

b. A pipe line carrying oil of specific gravity 0.8 changes in diameter from 300mm at position. A to 500mm diameter at position B. Which is 5m at a higher level. If the pressure at A and B are $20N/cm^2$ and $15N/cm^2$ respectively and discharge is 150lit/sec. determine the loss of head and direction of flow. **(12 Marks)**

OR

6 a. What is venturimeter? Derive an expression for discharge through the venturometer. **(10 Marks)**

b. A venturimeter is to be installed in a 180mm pipe line horizontally at a section where the pressure is 110KPa (gauge). If the maximum flow rate of water in the pipe is $0.15m^8/s$, find the least diameter fo the throat so that pressure at the throat does not fall below 80KPa (vaccum). Assume that 4% of the differential heat is lost between inlet and the throat. **(10 Marks)**

Module-4

7 a. What is dimensional analysis? State Buckingham π theorem and explain the procedure to determine π groups. **(10 Marks)**

b. The efficiency η of a fan depends on the density S_1 the dynamic viscosity μ, of the fluid, the angular velocity w, diameter D of the rotor and discharge Q. Express η in terms of dimensionless parameter. **(10 Marks)**

OR

8 a. Derive Darcy–Weisboch expression for friction head loss in a pipe flow. **(10 Marks)**

b. At a sudden enlargement of water main form 0.24m to 0.48m diameter, the hydraulic gradient rises by 10mm. Estimate the rate of flow. **(10 Marks)**

Module-5

9 a. Show that for Laminar flow through a circular pipe, the mean velocity is half of the maximum velocity. **(10 Marks)**

b. Water at 15°C flows between two large parallel plates at a distance of 1.6mm apart. Determine : i) the maximum velocity ii) pressure drop per unit length iii) shear stress at the walls of the plates if the average velocity is 0.2m/s the viscosity of water at 15°C is given as 0.01 poise. **(10 Marks)**

OR

10 a. Obtain an expression for velocity of sound in a compressible fluid in terms of change of pressure and change of density. **(10 Marks)**

b. A projectile travels in air of pressure $15N/cm^2$ at 10°C, at speed of 1500km/hr. Find the mach number and mach angle. Assume r = 1.4 and R = 287J/kg K. **(10 Marks)**

* * * * *