



# CBCS SCHEME

18MT42

## Fourth Semester B.E. Degree Examination, July/August 2022 Fluid Mechanics and Machines

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 :  
i) Viscosity      ii) Surface tension      iii) Capillarity. (06 Marks)  
b. Explain the effect of temperature and pressure on viscosity. (06 Marks)  
c. What do you mean by single column manometers? How are they used for the measurement of pressure? (08 Marks)

OR

- 2 a. Define i) Gauge pressure      ii) Vacuum pressure      iii) Absolute pressure with sketch. (05 Marks)  
b. Derive an expression for total pressure and centre of pressure for a vertical plane submerged in liquid. (10 Marks)  
c. Determine the total pressure on a circular plate of diameter 1.5m which is placed vertically in water such a way that the centre of plate is 3m below the free surface of water. Also find the position of centre of pressure (05 Marks)

### Module-2

- 3 a. Derive continuity equation in Cartesian coordinates in three dimensions. (10 Marks)  
b. If for a two – dimensional potential is given by  $\phi = x(2y - 1)$ , determine the velocity at the point (4, 5). Determine also the value of stream function  $\Psi$  at the point P. (10 Marks)

OR

- 4 a. State Bernoulli's theorem for steady flow of an incompressible fluid. Derive an expression for Bernoulli's theorem from first principle and state the assumptions made. (12 Marks)  
b. Water is flowing through a pipe having diameter 300mm and 200mm at the bottom and upper end respectively. The intensity of pressure at the bottom end is  $24.525 \text{ N/cm}^2$  and the pressure at the upper end is  $9.81 \text{ N/cm}^2$ . Determine the difference in datum head if the rate of flow through pipe is  $40 \text{ l/s}$ . (08 Marks)

### Module-3

- 5 a. Explain Dimensionally Homogeneous equation. (04 Marks)  
b. What do you mean by similitude? Explain types of similitudes. (08 Marks)  
c. Explain in brief about the following :  
i) Dimensionless number      ii) Reynold's number  
iii) Euler's number      iv) Mach number. (08 Marks)

OR

- 6 a. Derive an expression for discharge through venturimeter. (10 Marks)  
b. Explain Pitot tube, with a neat sketch. (04 Marks)

- c. Water flows over a rectangular weir 1m wide at a depth of 150mm and afterwards passes through a triangular right angled weir. Taking  $C_d$  for the rectangular and triangle weir as 0.62 and 0.59 respectively, find the depth over the triangular weir. (06 Marks)

**Module-4**

- 7 a. Define Turbomachine with neat figure and list the parts of turbomachine. (05 Marks)  
 b. Compare turbomachine with positive displacement machines. (05 Marks)  
 c. Derive Euler turbine equation and explain alternate form of Euler turbine equation. (10 Marks)

**OR**

- 8 a. Write a note on :  
 i) General analysis of turbomachine    ii) Components of energy transfer. (12 Marks)  
 b. Classify turbomachines and give example for each class. (08 Marks)

**Module-5**

- 9 a. Derive an expression for maximum hydraulic efficiency of Pelton wheel. (10 Marks)  
 b. A reaction turbine works at 450 rpm under a head of 120m. Its diameter at inlet is 120cm and the flow area is  $0.4\text{m}^2$ . The angles made by absolute and relative velocities at inlet are  $20^\circ$  and  $60^\circ$  respectively with the tangential velocity. Determine i) The volume flow rate  
 ii) The power developed                      iii) Hydraulic efficiency. (10 Marks)

**OR**

- 10 a. What is Draft Tube? What are its functions and mention types of draft tube? (08 Marks)  
 b. What is Compounding of Steam Turbine? Explain with the help of a schematic diagram  $D_L$  two row velocity compounded impulse turbine stage. (12 Marks)

\*\*\*\*\*