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**B.Tech. (Sem. – 4<sup>th</sup>)**  
**FLUID MECHANICS AND MACHINERY**  
**SUBJECT CODE : AE – 206**  
**Paper ID : [A0711]**

Time : 03 Hours

Maximum Marks : 60

**Instruction to Candidates:**

- 1) Section - A is **Compulsory**.
- 2) Attempt any **Four** questions from Section - B.
- 3) Attempt any **Two** questions from Section - C.

**Section - A****Q1)****(10 × 2 = 20)**

- a) Define specific weight and specific volume along with their units?
- b) Define briefly the phenomena of cavitation?
- c) Show graphically how the bulk modulus of elasticity varies with increasing pressure.
- d) Define center of pressure. Why it is different from center of gravity.
- e) Explain the principle of reaction turbine?
- f) Explain the functioning of a pitot tube?
- g) State the formula and importance of mach number?
- h) Give atleast 2 differences between the free vortex flow and forced vortex flow?
- i) Define water hammer?
- j) Why is mercury a preferred fluid used in manometers and thermometers?

**Section - B****(4 × 5 = 20)**

- Q2)** A rectangular gate is in the vertical side of the reservoir can turn freely about its upper edge which is horizontal and is fastened at its two lower corners. The gate is 1 m wide and 2 m high and its upper edge is 2 m below the water level. Determine the reactions at the lower corners assuming them to be equal.
- Q3)** Gasoline flows through a constriction in a horizontal pipe where the diameter is reduced from 20 cm to 10 cm. The pressure in the 20cm pipe just upstream of constriction is 60kPa. Considering no loss of energy in the flow passage, make calculations for the maximum discharge that can be passed through the constriction without the occurrence of cavitation. The barometer reads 76cm of mercury and for the gasoline vapour pressure is 56 KPa (abs) and density is 650 kg/m<sup>3</sup> for the pressure and temperature condition involved.

- Q4)** How does the viscosity of liquids and gases vary with the rise in temperature? Explain with reasons.
- Q5)** Wave motion on the section of a beach is to be studied by means of a geometrically similar model having a length scale ratio of 1 : 10. Neglecting friction and surface tension effects, calculate the velocity ratio, time ratio, acceleration ratio and force ratio between model and prototype. Take  $\rho = 1020 \text{ kg/m}^3$  for the beach water and  $\rho = 1000 \text{ kg/m}^3$  for the fresh water used in the model.
- Q6)** Describe the construction and functioning of any 2 devices for flow measurement?

**Section - C**

**(2 × 10 = 20)**

- Q7)** Derive the Darcy weisbach's equation for head loss due to friction in circular pipes?
- Q8)** A conical diffusing section diverges uniformly from 0.1 m diameter to 0.2 m diameter over a length of 1 metre. Find the local and convective acceleration at the middle of the diffuser. Consider the following two cases.
- (a) Rate of flow is 100 litres per second and it remains constant.
  - (b) Rate of flow varies uniformly from 100 litres/sec to 200 litres/sec in 5 seconds and the time of interest is when  $t = 2$  second. Velocity at any cross – section, perpendicular to the flow direction, may be assumed to be uniform.
- Q9)** Describe in detail the construction and working of centrifugal?

