

II B.Tech II Semester Supplementary Examinations, April/May 2005
FLUID MECHANICS
(Chemical Engineering)

Time: 3 hours

Max Marks: 70

Answer any FIVE Questions
All Questions carry equal marks

1. (a) Differentiate between total pressure and center of pressure
(b) Obtain an expression for the horizontal and vertical components of the resultant force on a submerged curved surface.
2. (a) Define Velocity head, Datum head and pressure head. What do they represent?
(b) A 40cm diameter pipe conveying water, branches into two pipes of diameters 30cm and 20cm respectively. If the average velocity in the 40cm diameter pipe is 3 m/sec. Find the discharge in this pipe. Also determine the velocity in 20cm pipe if the average velocity in 30cm diameter pipe is 2m/sec.
3. (a) Find an expression for the power transmission through pipes. What is the condition for maximum transmission of power .
(b) A pipe of diameter 250 mm and length 3500 m is used for the transmission of power by water. The total head at the inlet of the pipe is 500 m. Find the max. power available at the outlet of the pipe. Take $f=0.006$.
4. (a) Prove that the velocity of sound in a compressible fluid is given by $c = \sqrt{k/\rho}$ where k =Bulk modulus of fluid and ρ is density of fluid.
(b) A normal shock wave occurs in a duct in which air is flowing at a Mach number of 1.50. The static pressure and temperature upstream of the shock wave are 1.5 bar and 27°C. Determine the pressure, temperature and the Mach number downstream of the shock. Also calculate the strength of shock. Take $k=1.4$.
5. A bed of faggged silica sand 9 kg in weight, 1.24×10^{-4} m in size is to be fluidized in 0.1 m internal diameter cylindrical column with air at 21°C and entering at a rate of $3.14 \times 10^{-4} \text{ m}^3/\text{sec}$. The outlet pressure is 1.013×10^5 pascal. The specific gravity of sand is 2.65. Determine whether fluidization will occur if so estimate the expanded bed height. The value of minimum bed voidage is 0.48.
6. Write short notes on the following
 - (a) Valves.
 - (b) Fluid moving machinery.
 - (c) Positive displacement pumps.
7. Explain Positive displacement compressors with figures.

8. A horizontal venturimeter having a throat diameter of 20mm is set in a 75mm Internal diameter pipeline. A manometer containing mercury under water measures the pressure differential over the instrument. When the manometer reading is 500mm, what is the flow rate? If 12 percent of the differential is permanently lost, what is the power consumption of the meter?

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