

**II B.Tech II Semester Supplementary Examinations,
November/December 2005
FLUID MECHANICS
(Chemical Engineering)**

Time: 3 hours**Max Marks: 80**

**Answer any FIVE Questions
All Questions carry equal marks**

1. (a) Prove that the centre of pressure of a completely submerged plane surface is always below the centre of gravity of the submerged surface or atmost coincide with the centre of gravity when the plane surface is horizontal.
(b) A circular plate 3metres in diameter is submerged in water in such a way that the greatest and least depth of the surface (below water surface) are 2metre and 1metre respectively. Calculate
 - i. the total pressure on one side of the surface
 - ii. the position of center of pressure. [8+8]
2. (a) Differentiate between steady flow and unsteady flow.
(b) Sketch and explain Bernoullis equation between any two points in the direction of flow. Explain all the terms.
(c) Write any two applications of the Bernoullis equation. [4+8+4]
3. (a) What do you mean by laminar flow
(b) Derive an expression for the velocity distribution for viscous flow through a circular pipe. Also sketch the velocity distribution and shear stress distribution across the section of the pipe. [4+12]
4. (a) Distinguish between compressible and incompressible fluid flows
(b) What is the relation between pressure and density of a compressible fluid for isothermal process and adiabatic process
(c) Air has a velocity of 1000 Km/hr at a pressure of 9.81 KN/m^2 vacuum and a temperature of 47°C . Compute its stagnation properties, and the local Mach number. Take atmospheric presuure= 9.81 KN/m^2 , $R=287 \text{ Nm/kg } ^\circ\text{K}$. [2+6+8]
5. Obtain a relationship for the ratio of the terminal falling velocity of a particle to the minimum fluidizing velocity for bed of similar particles. Assume that stokes law and the Carman-Kozeny equation are applicable. What is the value of the ratio if the bed voidage at the minimum fluidizing velocity is 0.4. [16]
6. Explain the following in brief.
 - (a) Gate valves and globe valves
 - (b) Plug cocks and ball valves

- (c) Check valves [6+6+4]
7. A centrifugal fan is used to take flue gas at rest and at a pressure of 730mm Hg and a temperature of 90°C and discharge it at a pressure of 760mm Hg and a velocity of 50 m/sec. Calculate the power needed to move $17000\text{m}^3/\text{hour}$ of gas. The efficiency of the fan is 60% and the molecular weight of the gas is 32.0. [16]
8. Write short notes on
- (a) Pressure Recovery
- (b) Polytropic compression [8+4+4]

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