

**II B.Tech II Semester Supplementary Examinations, April/May 2005**  
**FLUID MECHANICS**  
**(Metallurgy & Material Technology)**

Time: 3 hours

Max Marks: 70

Answer any FIVE Questions  
All Questions carry equal marks

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1. (a) Discuss the following fluid properties.
  - i. Specific Gravity
  - ii. Capillarity
  - iii. viscosity
  - iv. compressibility.(b) Deduce an expression for determining the centre of pressure on a plane surface submerged under water inclined to the water surface at a given angle.
2. (a) Explain stream line, streak line and path line.  
(b) Define continuity equation. Obtain an expression for continuity equation for a three dimensional flow.
3. (a) State the momentum equation. How will you apply momentum equation for determining the force exerted by a flowing liquid on a pipe bend.  
(b) Derive an expression for the depth of paraboloid formed by the surface of a liquid contained in a cylindrical tank which is rotated at a constant angular velocity about its vertical axis.
4. (a) Define laminar and turbulent boundary layers, laminar sub-layer and boundary layer thickness.  
(b) What do you mean by separation of boundary layer? Explain the different methods of preventing the separation of boundary layer.
5. (a) Prove that the velocity distribution for viscous flow between two parallel plates when both plates are fixed across a section is parabolic in nature. Also prove that maximum velocity is equal to one and a half times the average velocity.  
(b) Water is flowing through a 15 cm diameter pipe with a co-efficient of friction  $f=0.05$ . The shear stress at a point 4 cm from the pipe wall is  $0.002 \text{ kgf/cm}^2$ . Calculate the shear stress at the pipe wall.
6. (a) Derive an expression for head loss due to friction in pipes.  
(b) A horizontal pipe of diameter 40cm is suddenly contracted to a diameter of 20cm. The pressure intensities in the larger and smaller pipe is given as  $1.5 \text{ kgf/cm}^2$  and  $1.30 \text{ kgf/cm}^2$  respectively. If  $C_V = 0.62$ , find the loss of head due to contraction. Also determine the rate of flow of water.
7. Explain the principle and working of the following with the help of neat sketches.

- (a) Venturimeter
- (b) Hot wire Anemometer
- (c) Differential Manometer

8. Write short notes on:

- (a) Mach number
- (b) Stream function
- (c) Free vortex and Forced vortex.

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