Code No: R5210106 **R5**

II B.Tech I Semester(R05) Supplementary Examinations, May/June 2010
FLUID MECHANICS
(Civil Engineering)

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

Answer any FIVE Questions
All Questions carry equal marks
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1. (a) Distinguish between
   i. Ideal and Read Fluids
   ii. Newtonian and Non- Newtonian Fluids
   iii. Gases and Vapours.
   iv. Adhesion and cohesion
   (b) The velocity distribution in a fluid is give by u = 40000 y (1-2y) where u is the velocity in m/sec at a distance of y meters normal to the boundary. If the dynamic viscosity of fluid is 1.8×10^{-4} poise, determine the shear stress at y = 0.2m. [8+8]
2. (a) Find the total pressure force and the depth of centre of pressure on an inclined plane surface submerged in a liquid.
   (b) A trapezoidal plate of top width 6m, bottom width 5m and height 3.5m is immersed vertically in water with its parallel sides parallel to the water level and its top edge is at a depth of 2.5m below the water level. Find the water thrust an one side of the plate and depth of centre of pressure. [8+8]
3. (a) Differentiate between the Eulerian and Lagrangian methods of representing fluid flow.
   (b) If stream function exists in a flow problem does it imply that velocity potential also exists. Explain.
   (c) The flow field of a fluid is given by $V = xyi + 2yzj - (yz + z^2)K$
   i. Show that it represents a possible three dimensional steady incompressible continuous flow.
   ii. Is this flow rotational or irrotational ? If rotational, determine at point A (2,4,6). [3+4+9]
4. (a) Define potential head, velocity head and datum head.
   (b) List out the assumptions and limitations of Bernoulli?s equation.
   (c) 360 liters per second of water is flowing in a pipe. The pipe is bent by 120^0 The diameters at the inlet and outlet of the bend being 360 mm 240 mm respectively and volume of the bend is $0.14m^3$. The pressure at the entrance is $72KN/m^2$ and the exit is 2.4m above the entrance section. Find the force exerted by water on the bend. [3+3+10]
5. (a) What is meant by Magnus effect. Explain.
   (b) Describe with the help of a sketch, the variation of drag coefficient for a cylinder over a wide range of Reynolds number.
   (c) A kite 0.8m×0.8m weighing 3.924N assumes an angle of 12^0 to the horizontal. The string attached to the kite makes an angle of 45^0 to the horizontal. The pull on the string is 24.525N when the wind is flowing at a speed of 30 Km/hr. Find the corresponding coefficient of drag and lift. Take mass density of air as $1.25Kg/m^3$. [3+4+9]
6. (a) Describe the characteristics of laminar and turbulent flows. Also give examples for these two types of flows.
   (b) Determine the pressure gradient and shear stress and the discharge per metre width for the laminar flow of oil with a maximum velocity of 1.5 m/sec between two horizontal parallel fixed plates which are 8cm apart. Take viscosity of oil as $1.962Nsec/m^2$. [8+8]
7. (a) Derive the Darcy - Weisbach equation for friction head loss in a pipe .
   (b) Water is flowing through a horizantal pipe line 1500m long and 200 mm in diameter. Pressures at the two ends of the pipe line are respectively 12 kpa and 2 kpa. If f = 0.015, determine the discharge through the pipe in litres per minute. Consider only frictional loss. [8+8]
8. (a) Explain the principle and working of pitot tube with the help of a neat sketch.
   (b) Petroleum oil of (Specific Gravity = 0.93 and viscosity = 13CP) flows isothermally through a horizontal 5cm pipe. A pitot tube is inserted at the center of a pipe and its leads are filled with the same oil and attached to a v-tube containing water. The reading on the manometer is 10 cm. Calculate the volumetric flow of oil in m^3/sec. The coefficient of pitot tube is 0.98. [8+8]

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