Code No: W0104 **Set No. 1**

II B.Tech I Semester Supplimentary Examinations, May/June 2009
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) What do you mean by Hydrostatic pressure.
   (b) Define Total pressure and centre of pressure
   (c) A circular plate 2.5m in diameter is submerged in water as shown in figure 2c. Its greatest and least depths below free surface of water are 3m and 2m respectively. Find
   i. Total pressure on front face of the plate and
   ii. the position of centre of pressure [3+4+9]

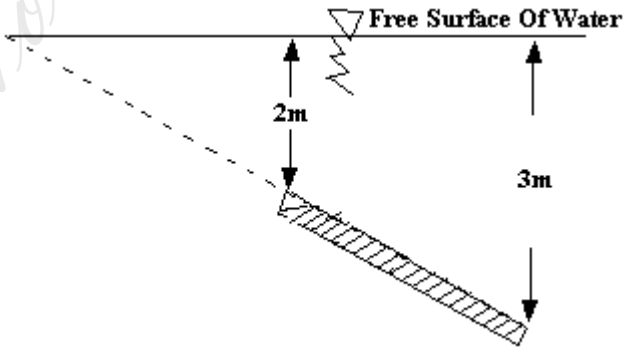

Figure 2c

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 moment of momentum equation. What is the difference between momentum equation and impulse momentum equation.

   (b) Explain which of the forces taken into consideration in Eulers equation of motion .

   (c) The discharge of water through a pipe of diameter 40 cm is 400 lit/sec. If the pipe is bend by 135^0, find the magnitude and direction of the resultant force on the bend. The pressure of flowing water is $29.43 N/cm^2$. [4+3+9]

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 $1.25 Kg/m^3$. [3+4+9]

6. (a) Prove that the velocity distribution for viscous flow between two parallel plates when both plates are fixed across a section parabolic in nature. Also phone that maximum velocity is equal to one and half times the average velocity.

   (b) Water is flowing between two large parallel plates which are 2 mm apart. Determine maximum velocity, pressure drop per unit length and the shear stress at walls of the plate if the average velocity is 0.4 m/sec. Take viscosity of water as 0.01 poise. [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 principal and working of venturimeter with the help of a neat sketch.

   (b) Water flows through a horizontal venturimeter of inlet diameter 15 cm and inlet pressure 215 kpa (absolute). Find the minimum throat diameter for the meter to pass a discharge of 150 lps without causing cavitations. Assume saturation vapour pressure of water = -80 kpa (gange). Assume atmospheric pressure = 76cm of mercury and Cd of the meter is 0.978. [8+8]

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