FM I : III SEM [OLD] : 11/06/15

Q.P. Code : 4530

(OLD COURSE)

(3 Hours) **[Total Marks : 100**

Note:

Question no.1 is compulsory

Solve any 4 questions out of remaining

Assume data wherever necessary and clearly mention the assumptions made.

Draw neat figures as required.

1. Answer any 4 of the following. 20
   a. Explain Mechanical Gauges
   b. Explain Newtonian & Non Newtonian fluid.
   c. Write a note on Langarangian & Eularian Method of fluid motion.
   d. Write a note on Bouancy & Metacentric height.
   e. Explain Vapor Pressure.

2. a. Derive Pascal's Law 10

   b. A U-tube differential manometer connects to pressure pipes at A and B such that difference between center line of A and B is 2.6m. The pipe A contains a liquid of specific gravity 1.6 under a pressure of 110 KN/m^2. The pipe B contains oil of specific gravity 0.8 under a pressure of 200KN/m^2. Mercury level in limb connecting pipe A is 1m below center line of pipe B find the difference of pressure measured by mercury as fluid filling U-Tube. 10

3. a. The velocity potential function for the 2 dimensional flow is $\Phi = x(2y-1)$. At a point P (4,5) determine the velocity and the value of stream function. 10

   b. A solid cube of size 0.5m each is made of a material of relative density 0.5. The cube floats' in a liquid of relative density 0.95 with two of its faces horizontal. Examine its stability. 10

4. a. An open cylinder 30 cm in diameter and 50 cm high is filled with water and rotated about its axis. Calculate the amount of water spilled when the speed of rotation is 240 rpm. 10

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b. Derive Bernoullis equation 10

5. a. An oil of relative density 0.90 flows through a vertical pipe of diameter 10 cm. The flow is measured by a 20 cm x 10 cm venturimeter. The throat is 10 cm above the inlet section. A differential U-tube manometer containing mercury is connected to the throat and the inlet. If C_d = 0.99, what is the flow for a manometer reading of 9 cm and the manometer reading for a flow of 50 liters/sec? 10

b. A circular plate 1.5 m diameter is submerged in water, with its greatest and least depths below the surface being 2 m and 0.75 m respectively. Determine the total pressure on one face of the plate, and the position of the centre of pressure. 10

6. a. Water flows over a rectangular sharp crested weir 1m long, the head over the sill of the weir being 0.66 m. The approach channel is 1.4 m wide and depth of flow in the channel is 1.2 m. Starting from first principles, determine the rate of discharge over the weir. Consider also the velocity of approach and the effect of end contractions. Take coefficient of discharge for the weir as 0.6. 10

b. A tank has two identical orifices in one of its vertical sides. The upper orifice is 1.5 m below the water surface and the lower one is 3 m below the water surface. Find the point at which the two jets coming out of orifices will intersect, if the coefficient of velocity is 0.92 for both the orifices. 10

7. Explain any four out of following 20

a. Stability conditions for floating and submerged bodies.
b. Orificemeter.
c. Total pressure and center of pressure
d. Capillarity and surface tension
e. Bordas mouthpiece
