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BME-028

01642

BACHELOR OF TECHNOLOGY IN MECHANICAL ENGINEERING (COMPUTER INTEGRATED MANUFACTURING)

Term-End Examination

June, 2011

BME-028 : FLUID MECHANICS

Time : 3 hours *Maximum Marks : 70*

*Note : Attempt **any seven** questions. **All** questions carry **equal** marks. Use of calculator is permitted.*

1. (a) Explain the various types of fluid flow with suitable sketch. 5

(b) A tank shown in fig. 1 contains oil of specific gravity 0.80. If it is given acceleration of 5.0 m/sec^2 along 30° inclined plane in the upward direction, determine the slope of free surface and pressure at B. 5

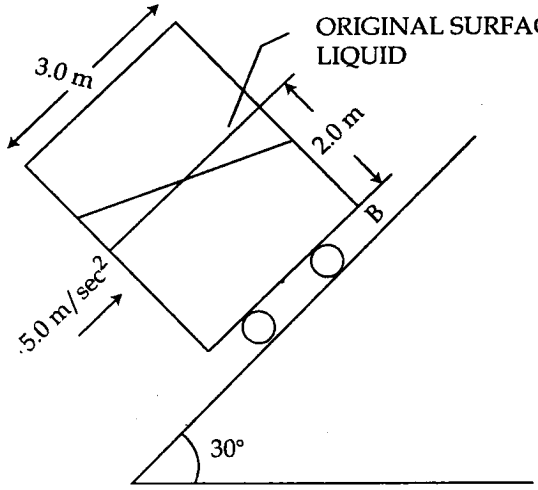

Fig. 1

2. (a) Velocity components for steady, incompressible flow are. 5

(i) $u = 2x - 3y$, $v = x - 2y$ and $w = 0$

(ii) $u = 2x^2 + y^2$ and $v = -4xy$

Is the equation of continuity satisfied in these cases ?

(b) Describe various types of flow net methods with suitable sketches. 5

3. (a) Derive an expression for discharge over a sharp-edged weir. 5

(b) Find the force excerted on a fixed vane, when a set discharging 50 litres/sec water at 40 m/s is deflected through 120°. 5

4. (a) Derive Euler's equation in fluid particle moving along a steam line.

(b) A jump occurs in a 6.2 m wide channel carrying 15.5 m^3/s water at a depth of 320 mm. Determine y_2, v_2 and the losses in metre - Newtons per Newton (m N/N) and kilowatts (kW).

5. (a) Show that the time required to reduce the water level from H_1 to H_2 by rectangular weir is given by :

$$t = \frac{CA}{C_d L \sqrt{29}} \left(\frac{1}{\sqrt{H_2}} - \frac{1}{\sqrt{H_1}} \right) \text{in}$$

which A is the area of the reservoir, C_d is the discharge coefficient and L is the length of the weir.

(b) A 75 mm diameter orifice discharges 907.6 kg of water in 32.6 sec under a head of 4.90 m. The x and y co-ordinate of a point on the jet are 4.80 m and 1.3 m respectively. Determine C_v, C_c, C_d and head loss.

6. (a) Explain the working of capillary tube viscometer with neat sketch.

(b) Laminar flow takes place between the parallel plates 12 mm apart as shown in fig. 2. The plates are inclined at 45° with the horizontal. For the oil viscosity 0.85 kg/m.s and mass density of 1260 kg/m^3, the pressure at the two points 1.2 m vertically apart are 82 kN/m^2 and 260 kN/m^2 when upper plate moves at 2.3 m/s velocity relative to the lower plate but in opposite direction to the flow. Determine :

(i) Velocity distribution

(ii) Max. velocity

(iii) Shear stress on the top plate

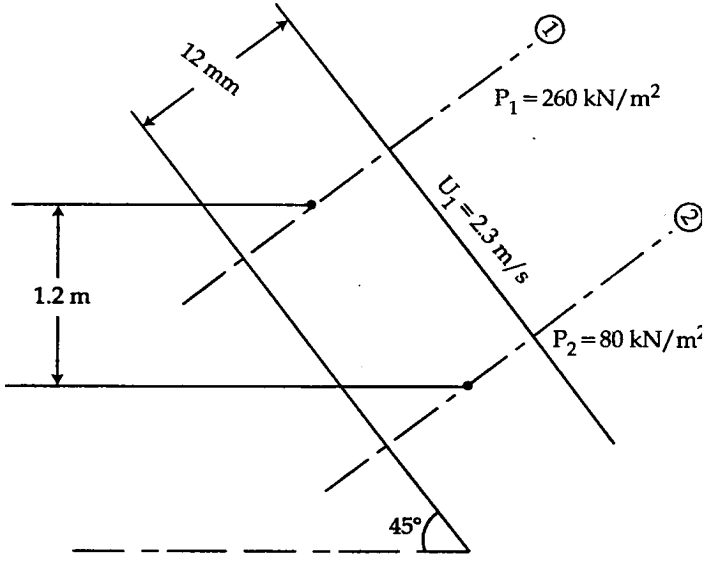

Fig. 2

(a) A slipper bearing moves towards left with a velocity of 1.6 m/s. The data for the bearing $L = 35$ cm, $a_1 = 0.04$ cm, $a_2 = 0.015$ cm and $\mu = 0.08$ kgms. Find the maximum load which can sustained by the bearing. Also find the maximum pressure intensity. 5

(b) Explain, why logarithmic law of viscosity distribution is not valid at the boundary ? 5

(a) A wire of 15 mm radius is dragged at a uniform velocity of 0.35 m/sec through a cylinder of radius 110 mm. The annular space is filled with the liquid of viscosity 1.2 kg/m.s. Find the power required to drag and the discharge. 5

(b) Differentiate between wall turbulence and free turbulence. 5

(a) Distinguish between the actual roughness and the effective roughness of a conduit boundary. 5

(b) Determine the head loss due to the flow of 100 litres of water through 100 meter length of 15 cm diameter pipe having relative roughness of 0.01. 5

. Write short notes. 5+5

(a) Energy correction factor and momentum correction factor.

(b) Notches and weirs.
