BACHELOR OF TECHNOLOGY IN MECHANICAL ENGINEERING (COMPUTER INTEGRATED MANUFACTURING)

01537

Term-End Examination

June, 2013

BME-028 : FLUID MECHANICS

Time : 3 hours *Maximum Marks : 70*

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

1. (a) How the U-tube manometer used for the measurement of Fluid Pressure ? Explain with neat sketch. 5

   (b) A circular opening, 3 cm diameter in a vertical side of the tank is closed by a disc of 3 m diameter which can rotate about the horizontal diameter. Calculate 5

   (i) the force on the disc

   (ii) the torque required to maintain the disc in equilibrium in the vertical position when the head of water above the horizontal diameter is 6 m.

2. (a) Differentiate between wall turbulance and free turbulance. 5

(b) A body has the cylindrical upper portion of 4m diameter and 2 m deep. The lower portion is curved one, which displaces a volume of 0.9 m^3 of water. The centre of buoyancy of the curved portion is at a distance of 2.10 m below the top of the cylinder. The centre of gravity of the whole body is 1.50 m below the top of the cyliner. The total displacement of water is 4.5 tonnes. Find the meta-centric height of the body. **5**

3. (a) Distinguish between rotational flow and irrotational flow. Give one example of each. **5**

(b) A closed cylindrical vessel of diameter 20 cm and height 100 cm contains water up to height of 70 cm. The air above the water surface is at a pressure of 78.48 KN/m^2. The vessel is rotated at a speed of 300 r.p.m. about its vertical axis. Find the pressure head at the bottom of the cylinder, if it is rotated about its vertical axis at 300 r.p.m. Find the pressure head at the bottom of the vessel : **5**

(i) at the centre

(ii) at the edge

4. (a) What is Venturimeter ? Derive an expression for the discharge through a venturimeter. **5**

(b) A horizontal venturimeter with inlet and throat diameters 30 cm and 15 cm respectively is used to measure the flow of water. The reading of differential manometer connected to inlet and throat is 10 cm of mercury. Determine the rate of flow. Take C_d=0.98. 5

5. (a) What do you understand by the terms fully submerged oriffice or partially sub-merged oriffice ? 5

(b) Find the discharge through a fully sub-merged oriffice of width 2m if the difference of water levels on bothsides of the oriffice be 800 mm. The height of water from top and bottom of the oriffice are 2.5 m and 3 m respectively. Take C_d=0.6. 5

6. (a) Explain the term co-efficient of friction. On what factors does this co-efficient depend ? 5

(b) A rough pipe of diameter 300 mm and length 800 m carries water at the rate of 0.4 m^3/s. The wall roughness is 0.015 mm. Determine the co-efficient of friction, wall shear stress, centre line velocity and velocity at a distance of 100 mm from the pipe wall. 5

7. (a) How will you determine the loss of head due to friction in pipes by using : 5

(i) Darey Formula

(ii) Chezy's Formula ?

(b) The rate of flow of water through a horizontal pipe is 0.3 m^3/s. The diameter of the pipe is suddenly enlarged from 250 mm to 500 mm. The pressure intensity in the smaller pipe is 13.734 N/cm^2. Determine 5

(i) loss of head due to sudden enlargement.

(ii) Pressure intensity in the large pipe and

(iii) Power lost due to enlargement

8. (a) Explain the different types of hydraulic similarities that must exist between a prototype and its model. 5

(b) A smooth flat plate of length 5m and width 2 m is moving with a velocity of 4m/s in stationary air of density as 1.25 kg/m^3 and kinematic viscosity 1.5×10^{-5} m^2/s. Determine thickness of the boundary layer at the trailing edge of the smooth plate. Find the total drag on one side of the plate assuming that the boundary layer is turblent from the very begining. 5

9. (a) What do you understand by Total drag on the body, co-efficient of drag and lift ? 5

(b) A kite $60cm \times 60cm$ weighing 2.943 N assumes an angle of 10° to the horizontal. The string attached to kite makes an angle of 45° to the horizontal. If the pull on the string is 29.43 N when the wind is flowing at a speed of 40 km/hr find the corresponding co-efficient of drag and lift. Density of air is given as 1.25 kg/m^3. 5

10. Write short notes on **any two** of the following. 5+5

(a) laminar boundary layer and turbulent boundary layer.

(b) Dimensional Analysis and Model analysis.

(c) Co-efficient of contration and co-efficient of discharge.