BACHELOR OF TECHNOLOGY IN MECHANICAL ENGINEERING (COMPUTER INTEGRATED MANUFACTURING)

01931

Term-End Examination

December, 2012

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) What is the difference between U-tube differential manometers and Inverted U-tube differential manometers? Where are they used ? 5

   (b) A solid cylinder of diameter 5.0 m has a height of 5.0 m. Find the meta-centric height of the cylinder if the specific gravity of the material of the cylinder is 0.7 and its floating in water with its axis vertical. State whether the equilibrium is stable or unstable. 5

2. (a) Define the equation of continuity. Obtain an expression for continuity equation for three dimensional flow. 5

(b) A 40 cm diameter pipe, conveying water branches in two pipes of diameters 30 cm and 20 cm respectively. If the average velocity in the 40 cm diameter pipe is 3 m/sec. Find the discharge in this pipe. Also determine the velocity in 20 cm pipe if the average velocity in 30 cm diameter pipe is 2 m/sec. 5

3. (a) What is pitot-tube ? How will you determine the velocity at any point with help of pitot tube? 5

(b) An oil of specific gravity 0.9 is flowing through a venturimeter having inlet diameter 20 cm and throat diameter 10 cm. The oil-mercury differential manometer slows a reading of 20 cm. Calculate the discharge of oil through the horizontal venturimeter. Take C_d=0.98 5

4. (a) Explain the classification of orifices and mouth pieces based on their shape, size and sharpness? 5

(b) A jet of water, issuing from a sharp edged vertical orifice under a constant head of 60 cm, has the horizontal and vertical co-ordinates measured from the vena contracta at a certain point as 10.0 cm and 0.45 cm respectively. Find the value of e_v. Also find the value of C_c if C_d=0.60. 5

5. (a) What do you understnd by turblent flow ? What factor decides the type of flow in pipes ? 5

(b) For turblent flow in a pipe of diameter 200 mm, find the discharge when the centre line velocity is 30 m/sec and velocity at a point 80 mm from the centre as measured by pitot-tube is 2.0 m/sec. Also find the co-efficient of friction and average height of roughness projections. 5

6. (a) Show that the loss of head due to sudden expansion in pipe line is a function of velocity head. 5

(b) A horizontal pipe of diameter 400 mm is suddenly contracted to a diameter of 200 mm. The pressure intensifies in the large and smaller pipe is given as 14.715 N/cm^2 and 12.753 N/cm^2 respectively. If C_c=0.62, find the loss of head due to contraction. Also determine the rate of flow of water. 5

7. (a) What are the methods of dimensional analysis ? Describe the Rayleigh's method for dimensional analysis. 5

(b) A pipe of diameter 1.8 m is required to transport an oil of specific gravity 0.8 and viscosity 0.04 poise at the rate of 4 m^3/sec. Tests were conducted on a 20 cm diameter pipe using water at 20°C. Find the velocity and rate of flow in the model viscosity of water at 20°C = 0.01 poise. 5

8. (a) A thin plate is moving in still atmosphere air at a velocity of 4 m/sec. The length of the plate is 0.5 m and width 0.4 m. Calculate the 5

(i) thickness of the boundary layer at the end of the plate and

(ii) drag force on one side of the plate. Take specific weight of air as 12.5 N/m^2 and kinematic viscosity 0.15 stokes.

(b) What do you mean by separation of boundary layer ? What is the effect of pressure gradient on boundary layer separation ? 5

9. (a) How are the drag and lift forces act on a body immersed in a moving fluid ? 5

(b) A jet plane weighs 19620 N has a wing area of $25m^2$. It is flying at a speed of 200 km per hour. When the engine develops 588.6 kW and 70% of this power is used to over come the drag resistance of the wing. Calculate the Co-efficient of lift and co-efficient of drag for the wing. Take specific weight of air as 1.25 kg/m^3 5

10. Write short notes on a***ny two*** of the following : **2x5=10**

(a) buoyancy and centre of buoyancy

(b) compressible and incompressible flow

(c) Drag and Lift