00949

# BACHELOR OF TECHNOLOGY IN MECHANICAL ENGINEERING (COMPUTER INTEGRATED MANUFACTURING)

## Term-End Examination

## December, 2010

## 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) How the fluid pressure measured by U-tube manometer ? Explain with neat sketch. 5

   (b) A hollow cube 1m on each side weighs 2.4 kN. The cube is tied to solid concrete block weighing 10 kN. Will these two objects tied together float or sink in water ? Specific gravity of concrete is 2A. 5

2. (a) Discuss the methods of fluid flow analysis with suitable sketch. 5

(b) Following are the velocity components 5

(i) $U=3x+5y+6z$, $V=5x-3y$, $W=5x+5y+5$

(ii) $U=4xy$, $V=5yz$

$W=6yz+z^2$

Do these two cases represents irrotational flow ?

Determine velocity potential in each case.

3. (a) Discuss the significance of the $\pi$-Theorem. 5

(b) A scale model 1.5 has been made of sonar device beneath a submarine. If laboratory tests on this device reveal that the drag on it is 15 newtons at a speed of 18 m/sec, find the corresponding velocity and drag force of the proto type. Assume that density and velocity of water in the model and proto type are identical. 5

4. (a) Explain the working of pilot tube with neat sketch. 5

(b) At a point in the pipeline the diameter is 22 cm, the velocity of water is 3.8 m/s and the pressure is 3.6 Kg/cm$^2$. At another point 16 m down stream, the diameter reduces to 12 cm is shown in fig No.1 5

Calculate the pressure at this point, If the pipe is

(i) horizontal.

(ii) vertical with flow downward.

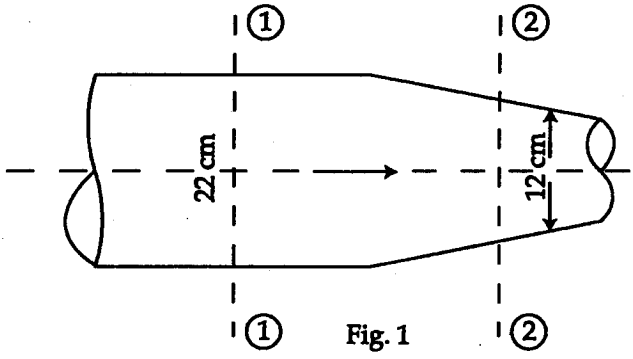

Fig. 1

5. (a) Describe the hydraulic jump with suitable sketch. 5

(b) If a boat requires a force of 2.5 kN to move it through water at 28 Km/hr with a 16 cm diameter jet, determine the power required by the boat. 5

6. (a) Derive an expression for head loss in orifice flow in terms of co-efficent of velocity and jet velocity. 5

(b) The head loss in flow through a 8 cm diameter orifice under a certain head is 20 cm of water and the velocity of water is in the jet is 7m/sec. If the co-efficient of discharge is 0.61 Determine 5

(a) head on the orifice.

(b) diameter of the jet.

(c) $C_V$.

7. (a) Kerosine oil flows upwards through inclined parallel plates at the rate of 2.2 litres/ sec per meter width. The distance between the parallel plates is 25 m with the horizontal. Determine the difference of pressure between two sections 12 m a part. 5

Take $\rho = 800$ kg/m$^2$ and $\mu = 0.0021$ N sec/m$^2$

(b) A rotating cylinder viscometer inner diameter 90 mm, outer diameter 100 mm, depth of immersion of Inner cylinder, Hz=180 mm, clearance at the bottom e=3 mm, augular speed n=80 rpm, total torque t=0.35 nm. Determine the viscosity of the fluid. 5

8. (a) Differentiate between luminar and turbulent flow. 5

(b) A 300 mm diameter pipe with friction factor of 0.02 has a pipe fitting with loss coefficient of 1.9 and 200 mm diameter pipe of 0.022. Determine their equivalent lengths in terms of 300 mm in diameter pipe. 5

9. (a) Discuss the physical significance of Reynolds number and froude number. 5

(b) A 100 cm diameter, 50 km long steel pipe with a thickness of 10 mm carries water at a rate of 2.0 $m^3/s$. What will be the increase in pressure, if a valve at the down stream end of the pipe is closed in (i) 3 seconds (ii) 11 seconds ? 5

Take E for steel and water as $2.08 \times 10^{11} N/M^2$ and $2.08 \times 10^9 N/M^2$ respectively. What will be the pressure rise in (i) above if the pipe is treated as rigid ?

10. Write short notes of the following. 5+5

(i) Laminar and turbulent flow.

(ii) Rotational and irrotational flow.