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**BIME-006**

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# B.Tech. MECHANICAL ENGINEERING (BTMEVI)

## Term-End Examination

## December, 2011

## BIME-006 : THERMOFLUID ENGINEERING

*Time : 3 hours* *Maximum Marks : 70*

***Note :*** *Attempt **any five** questions and all questions carry **equal** marks. Use of non programmable scientific calculator is allowed.*

**1.** (a) Define the equation of continuity. Obtained an expression for continuity equation for a three dimensional flow. 7

(b) A 30 cm. diameter pipe, conveying water, branches into two pipes of diameters 20 cm. and 15 cm. respectively. If the average velocity in the 30 cm. diameter pipe is 2.5 m/s, find the discharge in this pipe. Also determine the velocity in 15 cm. pipe if the average velocity in 20 cm. diameter pipe is 2 m/s. 7

**2.** (a) State the momentum equation. How will you apply momentum equation for determining the force exerted by a flowing liquid on a pipe bend ? 7

(b) A 45° reducing bend is connected in a pipe line, the diameters at the inlet and outlet of the bend being 600 mm and 300 mm respectively. Find the force exerted by water on the bend if the intensity of pressure at inlet to bend is 8.829 $N/cm^2$ and rate of flow of water is 600 liters/s. 7

3. (a) Define the Normal shock and derive its governing equation. 7

(b) Describe the flow through ducts of constant area with its governing equation. 7

4. (a) Derive an expression for the velocity distribution for viscous flow through a circular pipe. Also sketch the velocity distribution and shear stress distribution across a section of the pipe. 7

(b) A fluid of viscosity 0.7 $N.s/m^2$ and specific gravity 1.3 is flowing through a circular pipe of 100 mm diameter. The maximum shear stress at the pipe wall is given as 196.2 $N/m^2$. Find : 7

(i) the pressure gradient

(ii) the average velocity

(iii) Reynold no. of the flow.

5. (a) What is meant by boundary layer ? Why does is increases with distance from upstream edge ? 7

(b) What is a draft tube ? Why it is used in a reaction on turbines ? Describe with sketch two different types of draft tube. 7

6. (a) Draw neat sketches of the Pelton turbine and Francis Turbine. 7

(b) What is cavitation ? How can it be avoided in reaction turbine ? 7

7. Write the short notes at ***any four***. **3½x4=14**

(a) Impulse turbine

(b) Reaction turbine

(c) Velocity potential function

(d) Stream function

(e) Euler's Equations.

(f) Momentum Equation

(g) Governing of turbine.