BIME-006

B.Tech. – VIEP – MECHANICAL ENGINEERING (BTMEVI)

Term-End Examination
December, 2015

BIME-006 : THERMOFLUID ENGINEERING

Time : 3 hours   *Maximum Marks : 70*

Note : *Attempt any* ***seven*** *questions. All questions carry equal marks. Use of calculators is allowed.*

1. Distinguish between path line, stream line and streak line. *10*

2. Obtain the equation to the streamlines for the velocity field given as

    $v = 2x^2 i - 6x^2 yj.$ *10*

3. Derive Darcy-Weisbach formula for calculating the loss of head due to friction in a pipe. *10*

4. What is meant by average drag coefficient ? How does it differ from the local drag coefficient ? *10*

5. The velocity distribution in the boundary layer is given by $\dfrac{u}{U} = \dfrac{y}{\delta}$, where u is the velocity at a distance y from the plate and $u = U$ at $y = \delta$, 'δ' being the boundary layer thickness. Find the

(a) displacement thickness

(b) momentum thickness *10*

6. Draw a schematic diagram of a Francis turbine and explain briefly its construction and working. *10*

7. A Kaplan turbine develops 22000 kW at an average head of 35 m. Assuming a speed ratio of 2, flow ratio of 0·6, diameter of the boss equal to 0·35 times the diameter of the runner and an overall efficiency of 88 percentage, calculate the diameter, speed and specific speed of the turbine. *10*

8. Derive an expression for maximum discharge through convergent-divergent nozzle for steam. *10*

9. A turbine is to operate under a head of 25 m at 200 rpm. The discharge is 9 m^3/s. If the efficiency is 90%, determine the performance of the turbine under a head of 20 m. *10*

10. Write short notes on any *four* of the following : *10*

   (a)   Unit Speed

   (b)   Specific Speed

   (c)   Drag and Lift

   (d)   Adiabatic Flow (Fanno line)

   (e)   Lagrangian Method