PVP 14

Code: ME3T3, AE3T3

II B.Tech - I Semester–Regular/Supplementary Examinations – November 2017

FLUID MECHANICS AND HYDRAULIC MACHINES

(Common for ME, AE)

Duration: 3 hours Max. Marks: 70

PART – A

Answer ***all*** the questions. All questions carry equal marks

11x 2 = 22 M

1. a) Define viscosity and write the units of kinematic viscosity.
   b) State Pascal's law and give some examples where this principle is applied.
   c) Differentiate between laminar flow and turbulent flow.
   d) Write the Darcy Weisbach equation and explain.
   e) What are the assumptions taken in deriving the Bernoulli's equation?
   f) What is the function of a draft tube?
   g) What is the working principle of Pitot tube?
   h) What is the principle of Venturimeter? What is the quantity that is be measured from this device?
   i) Differentiate between the turbine and a pump.
   j) Define specific speed and its significance.
   k) Mention the important parts of a centrifugal pump.

PART – B

Answer any ***THREE*** questions. All questions carry equal marks.
3 x 16 = 48 M

2. a) If the equation of a velocity profile over a plate is $v = 2y^{2/3}$; in which 'v' is the velocity in m/s at a distance of y meters above the plate, determine the shear stress at y= 0 and y= 0.075 m. Given μ = 8.35 poise. 4 M

b) Calculate the capillary effect in mm in a glass tube 3 mm in diameter when immersed in (i) water (ii) mercury. Both the liquids are at 20^0C and the values of the surface tensions for water and mercury at 20^0C in contact with air are respectively 0.0736 N/m and 0.51 N/m. Contact angle for water is 0^0 and for mercury $=130^0$. 8 M

c) Explain about stream lines and streak lines in a fluid flow. 4 M

3. A pipeline ABC 180 m long is laid on an upward slope of 1 in 60. The length of the portion AB is 90 m and its diameter is 0.15 m. At 'B' the pipe section suddenly enlarges to 0.30 m diameter and remains so for the remainder of its length BC, 90 m. A flow of 50 liters per second is pumped into the pipe at its lower end A and is discharged at the upper end C into a closed tank. The pressure at the supply end A is 137.34 kN/m^2. Sketch (a) the total energy line, (b) the hydraulic grade line and

also find the pressure at the discharge end C. Take f= 0.02. 16 M

4. a) Find the expression for the force exerted by the jet on a flat vertical plate moving in the direction of the jet. 8 M

b) A rectangular notch of crest width 0.4m is used to measure the flow of water in a rectangular channel 0.6 m wide and 0.45 m deep. If the water level in the channel is 0.225 m above the weir crest, find the discharge in the channel. For the notch assume C_d= 0.63 and take velocity of approach into account. 8 M

5. a) A Pelton wheel is to be designed for a head of 60 m when running at 200 r.p.m. The Pelton wheel develops 95.6475 kW shaft power. The velocity of the buckets = 0.45 times the velocity of the jet, Overall efficiency=0.85 and Co-efficient of velocity is equal to 0.98. 8 M

b) Give the classification of turbines and explain them briefly. 8 M

6. a) With a neat sketch explain the working of centrifugal pump. 8 M

b) Explain the effect of acceleration in suction and delivery pipes on indicator diagram. 8 M