

Code: R7210202

B.Tech II Year I Semester (R07) Supplementary Examinations December 2015

FLUID MECHANICS & HYDRAULIC MACHINERY

(Electrical & Electronics Engineering)

(For 2008 Regular admitted batch only)

Time: 3 hours

Max. Marks: 80

Answer any FIVE questions
All questions carry equal marks

- 1 (a) A plate has an area of 1 m^2 . It slides down on inclined plane having angle of inclination 45° to the horizontal with a velocity of 0.5 m/s . The thickness of oil film between the plane and the plate is 1 mm . Find the viscosity of the fluid if the weight of the plate is 70.72 N .
(b) Explain Piezometer and U-tube manometer briefly.
- 2 (a) Derive continuity equation for one dimensional flow.
(b) Water is flowing through a tapering pipe having diameters 300 mm and 150 mm at sections 1 and 2 respectively. The discharge through the pipe is 40 lps . The section 1 is 10 m above datum and section 2 is 6 m above datum. Find the intensity of pressure at section 2 if that at section 1 is 400 kN/m^2 .
- 3 At a sudden enlargement of a water main from 240 mm to 480 mm diameter, the hydraulic gradient rises by 10 mm . Estimate the rate of flow.
- 4 A jet of water having a velocity of 15 m/s strikes a curved vane which is moving with a velocity of 5 m/s in the same direction as that of the jet at inlet. The vane is so shaped that the jet is deflected through 135° . The diameter of the jet is 100 mm . Assuming the vane to be smooth find force exerted by the jet on the vane in the direction of motion, power exerted on the vane and efficiency of the vane.
- 5 What are the various types of hydropower plants? Explain in detail.
- 6 A Francis turbine with an overall efficiency of 70% is required to produce 147.15 kW . It is working under a head of 8 m . The peripheral velocity $= 0.30\sqrt{2gH}$ and the radial velocity of flow at inlet is $0.96\sqrt{2gH}$. The wheel runs at 200 r.p.m and the hydraulic losses in the turbine are 20% of the available energy. Assume radial discharge, determine the guide blade angle, the wheel vane angle at inlet and diameter of the wheel at inlet and width of wheel at inlet.
- 7 (a) A Pelton wheel develops 5520 kW under a head of 240 m at an overall efficiency of 80% when revolving at a speed of 200 r.p.m . Find the unit discharge, unit power and unit speed. Assume peripheral coefficient $= 0.46$. If the head on the same turbine falls during the summer season to 160 m , find the discharge, power and speed for this head.
(b) Explain the term 'Cavitation' with respect to turbines.
- 8 (a) A double acting reciprocating pump having piston area 0.1 m^2 has a stroke 0.30 m long. The pump is discharging 2.4 m^3 of water per minute at 457 rpm , through a height of 10 m . Find the slip of the pump and the power required to drive the pump.
(b) Give the classification of centrifugal pumps.