Code: 9A01308

R09

B.Tech II Year I Semester (R09) Supplementary Examinations June 2017
FLUID MECHANICS & HYDRAULIC MACHINERY
(Electrical & Electronics Engineering)

Time: 3 hours   Max. Marks: 70

Answer any FIVE questions
All questions carry equal marks
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1 (a) Derive the hydrostatic law of pressure distribution.
   (b) The height of a crop plant from root end to leaf tip is 1.56 m. The cell diameter through which the sap is expected to rise may be taken as 0.025 mm. If the surface tension force of the sap is 0.098 N/m what is the contact angle of the force with the vertical? Assume that the sap has the same density as that of water.

2 (a) Derive Bernoulli's equation for the flow of an incompressible frictionless fluid from consideration of momentum.
   (b) A 45° reducing bend is connected in a pipe line, the diameters at the inlet and outlet of the bend being 40 cm and 20 cm respectively. Find the force exerted by water on the bend if the intensity of pressure at inlet of bend is 21.58 N/cm^2. The rate of flow of water is 500 litres/s.

3 (a) Give a graph of variation of friction head loss through a pipe against average velocity. Explain the terms: upper and lower critical velocities.
   (b) Two water tanks are connected by a horizontal compound pipe comprising two series pipes, one of 300 m length, diameter 20 cm and another of 200 m length, diameter 10 cm, starting from the high level reservoir. Assume f = 0.008 for both pipes and consider minor losses treating all junctions to be abrupt in section change. If the discharge through the system is 0.03 cumec, determine the water level difference between the two tanks.

4 (a) A jet of water moves smoothly over the surface of a curved vane. Analyze the forces acting on the vane and determine the resultant force in magnitude and direction. Assume shock less flow at entry and exit.
   (b) Water impinges on a series of curved vanes entering at 30^0 and leaving at 120^0 to the direction of motion of vanes. The velocity of water at entry is 30 m/s and the vane velocity both at its inlet and exit tips is 15 m/s. Determine the vane angles for no shock conditions, the work done per unit weight of fluid and the hydraulic efficiency of the system. Neglect friction effects.

5 (a) Describe pumped storage plant with a neat sketch.
   (b) Write short notes on: (i) Scroll casing. (ii) Draft-tube. (iii) Tailrace.

6 (a) Differentiate between Reaction turbines and hydraulic turbines.
   (b) Draw a neat diagram of Pelton turbine and explain its working.

7 (a) Derive the equation of unit speed and unit discharge of a turbine.
   (b) Where is the location of surge tank in hydro power installation? Explain with a neat sketch.

8 (a) How are pumps classified? Give the approximate values of specific speed for different types.
   (b) Discuss in general the main and operating characteristics of a centrifugal pump. What is the importance of constant efficiency curves?

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