Code: 13A01307

R13

B.Tech II Year I Semester (R13) Regular Examinations December 2014

FLUID MECHANICS & HYDRAULIC MACHINERY

(Electrical and Electronics Engineering)

Time: 3 hours Max. Marks: 70

PART – A

(Compulsory Question)

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1 Answer the following: (10 X 02 = 20 Marks)

(a) Define viscosity. How it varies with temperature?
(b) What is continuity equation? Explain continuity equation in two dimensional flow.
(c) What are different types of losses in pipes? Explain.
(d) What are different methods of describing fluid motion?
(e) Explain the momentum principles.
(f) Write short notes on water hammer.
(g) Define coefficient of discharge.
(h) What is meant by centrifugal pump? Define specific speed of the pump.
(i) Explain about priming of a centrifugal pump.
(j) Explain about net positive suction head (NPSH).

PART – B

(Answer all five units, 5 X 10 = 50 Marks)

UNIT - I

2 (a) What are different types of fluid flow? Explain them.
(b) A 25 cm diameter pipe carries oil of specific gravity 0.9 at a velocity of 3 m/s. At another section the diameter is 20 cm. Find the velocity at this section and also mass rate of flow of oil.

OR

3 (a) Define the equation of continuity. Obtain an expression for continuity equation for a three-dimensional flow.
(b) A fluid flow field is given by $V = x^2yi + y^2zj - (2xyz + yz^2) k$, Prove that it is a case of possible steady incompressible fluid flow. Calculate velocity and acceleration at the point (2, 1, 3).

UNIT - II

4 (a) Obtain the expression for discharge through venturimeter.
(b) Derive an expression for force in a pipe bend.

OR

5 (a) State the momentum equation. How will you apply momentum equation for determining the force exerted by a flowing liquid on a pipe bend?
(b) A pipe of 300 mm diameter conveying 0.30 m^3/s of water has a right angled bend in a horizontal plane. Find the resultant force exerted on the bend if the pressure at inlet and outlet of the bend are 24.525 N/cm^2 and 23.544 N/cm^2.

UNIT - III

6 (a) Obtain an expression for the force exerted by a jet of water on a fixed vertical plate in the direction of the jet.
(b) Find the force exerted by a jet of water of diameter 100 mm on a stationary flat plate, when the jet strikes the plate normally with velocity of 30 m/s.

OR

7 (a) Show that the efficiency of a free jet striking normally on a series of flat plates mounted on the periphery of a wheel can never exceed 50%.
(b) A jet of water of diameter 100 mm strikes a curved plate at its centre with a velocity of 15 m/s. The curved plate is moving with a velocity of 7 m/s in the direction of the jet. The jet is deflected through an angle of 150^o. Assume the plate is smooth, find (i) force exerted on the plate in the direction of the jet (ii) power of the jet (iii) efficiency.

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UNIT – IV

8 (a) With a neat sketch, explain the principle and working of a centrifugal pump.

(b) A centrifugal pump rotating at 1000 rpm delivers 160 liters/s of water against a head of 30 m. The pump is installed at a place where atmospheric pressure is $1x10^5$ P_a(abs.) and vapour pressure of water is 2 kPa (abs.). The head loss in suction pipe is equivalent to 0.2 m of water. Calculate minimum NPSH

OR

9 (a) With neat sketch, explain the principle of working of reciprocating pumps.

(b) A centrifugal pump is to discharge 0.118 m^3/s at a speed of 1450 rpm against head of 25 m. The impeller diameter is 250 mm, its width at outlet is 50 mm and manometer efficiency is 75%. Determine the vane angle at the outer periphery of the impeller.

UNIT – V

10 (a) What are surge tanks? What is the purpose of providing surge tanks? Explain the different types present in it.

(b) A turbine develops 7460 kW under a head of 24.7 m at 135 rpm. What is the specific speed? What would be the normal speed and output under a head of 19.5 m?

OR

11 (a) Discuss detail estimation of hydropower potential.

(b) What are the various applications of Hydroelectric power plant?

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