Code: 13A01402 **R13**

B.Tech II Year II Semester (R13) Supplementary Examinations December 2016

HYDRAULICS & HYDRAULIC MACHINERY

(Civil 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) If a rectangular channel 2.5 m wide carries water at a depth of 1.2 m, find the hydraulic radius.

(b) Give the definition for specific force.

(c) For a steep slope channel compare the bottom slope and normal depth of flow with corresponding critical values.

(d) In a rectangular channel there occurs a jump corresponding to $F_{r_1} = 2.5$. Find the critical depth, if the depth of flow before the jump is 2 m.

(e) What is angular momentum principle?

(f) What is a draft tube?

(g) Give the expression for maximum efficiency of a Pelton wheel.

(h) How do you draw operating characteristic curves of a centrifugal pump?

(i) Give the definition of a bluff body.

(j) What are distorted and undistorted models?

PART – B

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

UNIT – I

2 An earthen canal in good condition is 17 m wide at the bottom and has side slope of 2H to 1V. One side slope extends to a height of 7.8 m above the bottom level and the other side extends to an elevation of 1.8 m then extends flat to a distance of 150 m and rises vertically. If the slope of the canal is 0.7 m per 1610 m estimate the discharge. When the depth of water is 2.5 m. Assume Chezy's C = 35.

OR

3 (a) What is a venturi flume?

(b) A rectangular channel 2.4 m wide is provided with a venturi flume of 1.5 m wide throat. Find the quantity of water flowing through the venturi flume, when the depth of water into upstream side is 1.2 m and that at the throat is 0.9 m. Take coefficient of venturi flume as 1.

UNIT – II

4 A rectangular channel 7.5 m wide has a uniform depth of flow of 2.0 m and has a bed slope of 1 in 3000. If due to weir constructed at the downstream end of the channel water surface at a section is raised by 0.75 m, determine the water surface slope with respect to horizontal at this section. Take Maning's n = 0.02.

OR

5 (a) For a rectangular channel show that $y_1/y_2 = \frac{1}{2}\left[-1 + \sqrt{1 + 8F_{r_2}^2}\right]$, where y_1 and y_2 are the depth of flow before and after the formation of hydraulic jump.

(b) Give applications of hydraulic jump.

UNIT – III

6 A jet of water moving at 12 m/s impinges on a concave vane shaped to deflect the jet through 120° when stationay. If the vane is moving at 5 m/s, find the angle of jet so that there is no shock at outlet. What is the absolute velocity of jet at exit and the work done per kN of water? Assume that the vane is smooth and moving in the same direction as that of the jet.

OR

7 A Pleton wheel working under a head of 500 m produces 13000 kW at 430 r.p.m. If the efficiency of the wheel is 85% determine discharge of the turbine, diameter of the wheel and diameter of the nozzle. Assume suitable data.

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UNIT – IV

8 What are unit quantities? Also derive the expressions for unit speed, unit discharge and unit power for a hydraulic turbine.

OR

9 A centrifugal pump is to discharge 0.118 m^3/s at a speed of 1450 r.p.m against a head of 25 m. The impeller diameter is 250 mm, its width at outlet is 50 mm and manometric efficiency is 75%. Find the vane angle at the outer periphery of the impeller.

UNIT – V

10 (a) A 1.0 m long model of a ship is towed in a towing tank at a speed of 81 cm/s. To what speed of the ship of 64 m long does this correspond.

(b) For laminar flow in a pipe the drop in pressure ΔP is a function of the pipe length L, its diameter D, mean velocity of flow V and the dynamic viscosity μ. Using Rayleigh's method, develop an expression for ΔP.

OR

11 Oil with a free-stream velocity of 2 m/s flows over a thin plate 2 m wide and 2 m long. Calculate the boundary layer thickness and determine the total surface resistance of the plate. Take specific gravity as 0.86 and kinematic viscosity as 10^{-5} m^2/s.

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