Code: 13A01402 **R13**

B.Tech II Year II Semester (R13) Regular Examinations May/June 2015

HYDRAULICS & HYDRAULIC MACHINERY

(Civil Engineering)

Time: 3 hours Max. Marks: 70

PART – A

(Compulsory question)

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

(a) When do you call a section as hydraulically efficient?

(b) What are alternate depths?

(c) List out various channel bottom slopes.

(d) Define 'Length of Jump'.

(e) Find the force exerted by a jet of water of diameter 50 mm on a stationary flat plate when the jet strikes the plate normally with a velocity of 18 m/s.

(f) What is degree of reaction?

(g) What are unit quantities? What is the use of unit quantities?

(h) What is the principle behind a centrifugal pump?

(i) Give any two uses of dimensional analysis.

(j) A circular disc 4 m in diameter is held normal to a 26.4 m/s wind of density 1.2 kg/m^3. What force is required to hold it at rest? Take C_D = 1.1 for disc.

PART – B

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

UNIT – I

2 Water flows in a channel of the shape of isosceles triangle of bed width 'a' and sides making an angle of 45^0 with the bed. Find the relations between depth of flow 'd' and bed width 'a' for maximum velocity condition and for maximum discharge condition. Use Maning's formula and note that 'd' is less than 0.5 a.

(OR)

3 (a) Give the various characteristics of the critical state of flow through a channel section.

(b) For a constant specific energy of 2.1 N.m/N, calculate the maximum discharge that may occur in a rectangular channel 6.0 m wide.

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. Assume Maning's n = 0.02.

(OR)

5 The depth of flow of water at a certain section of a rectangular channel of 2 m wide is 0.3 m. The discharge through the channel is 1.5 m^3/s. Determine whether a hydraulic jump will occur and if so find its height and loss of energy per kg of water.

UNIT – III

6 A jet of water having a velocity of 35 m/s impinges on a series of vanes moving with a velocity of 20 m/s. The jet makes an angle of 30^0 to the direction of motion of vanes when entering and leaves at an angle of 120^0. Draw the triangles of velocities at inlet and outlet and find the angles of vanes tips so that water enters and leaves without shock, the work done per unit weight of water entering the vanes and the efficiency.

(OR)

7 What is a turbine? Give the various efficiencies. Also give the classification of turbines.

UNIT – IV

8 How do you design a Francis turbine runner? Explain in detail.

(OR)

9 (a) What is meant by priming?

(b) What are multistage centrifugal pumps?

UNIT – V

10 (a) Water is flowing through a pipe of diameter 30 cm at a velocity of 4 m/s. Find the velocity of oil flowing in another pipe of diameter 10 cm, if the condition of dynamic similarity is satisfied between the two pipes. The viscosity of water and oil is given as 0.01 Poise and 0.020 Poise the specific gravity of oil 0.7.

(b) What are distorted models? Give the advantages of distorted models.

(OR)

11 Calculate the friction drag on a plate 0.15 m wide and 0.45 m long placed longitudinally in a stream of oil flowing with a free stream velocity of 6 m/s. Also find the thickness of the boundary layer and shear stress at the trailing edge. Specific gravity of oil is 0.925 and its kinematic viscosity is 0.9 stokes.

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