Code: R7220104 **R7**

B.Tech II Year II Semester (R07) Supplementary Examinations, April/May 2013

HYDRAULICS & HYDRAULIC MACHINERY

(Civil Engineering)

Time: 3 hours Max Marks: 80

Answer any FIVE questions

All questions carry equal marks

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1 (a) Draw for given discharge, the specific energy head diagram. Mark the critical depth and the minimum specific energy head. Explain the salient features.

(b) A rectangular channel which is laid on a bottom slope of 0.0064 is to carry 20 m^3/s of water. Determine the width of the channel when the flow is in critical condition. Take n as 0.01.

2 (a) What are the characteristics and uses of hydraulic jump?

(b) The depths of water before and after hydraulic jump in a 5 m wide rectangular channel are 1 m and 8 m. Calculate the discharge through the channel and power lost in the jump.

3 (a) State whether the following equations are dimensionally homogeneous.

(i) Q = Πdbv (ii) $Q = C_d a\sqrt{2gh}$ (iii) $Q = Ac\sqrt{mi}$

(b) What are the fields of applications of Froude's law and mach law?

4 (a) Derive the expression for the work done per second on a series of moving curved vanes by a jet of water striking at one of the tips of the vane.

(b) A jet of water of diameter 100 mm strikes a curved plate at its center 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°. Assuming the plate smooth find:
(i) Force exerted on the plate in the direction of the jet.
(ii) Power of the jet, and
(iii) Efficiency.

Contd. in Page 2

Code: R7220104

R7

5 (a) Describe in detail, different classifications of turbines.

(b) A reaction turbine works at 500 r.p.m. under a head of 100 m. The diameter of turbine at inlet is 100 cm and flow area is 0.35 m^2.The angles made by absolute and relative velocities at inlet are 15° and 60° respectively with the tangential velocity. Determine:

(i) The volume flow rate.

(ii) The power developed, and

(iii) Efficiency. Assume whirl at outlet to be zero.

6 (a) What are the functions governing the hydraulic turbine. Explain with a sketch, the governing mechanism of an impulse turbine.

(b) A 65 cm diameter turbine runner develops 60 KW under a head of 30 m. Its speed is 4200 rpm. Compute its specific speed and unit speed. It is required to build a similar turbine to develop 250 KW under a head of 40 m. Calculate the required diameter.

7 (a) Discuss various methods adopted to increase the efficiency of a centrifugal pump by altering the shape of the casing.

(b) A centrifugal pump having an overall efficiency of 80% delivers discharge 1850 lpm, working against a height of 20 m through a pipe of 10 cm diameter and 95 m long. Calculate HP required to drive the pump. f = 0.0075.

8 (a) Discuss critically, how do you plan a power house

(b) The designed capacity of a hydropower plant is 1.32 x 10^5 KW. If the power generated in the plant is 9 x 10^4 KW, find the efficiency of the plant. If the peak discharge is 1.5 times the normal discharge, determine the plant capacity, plant factor and total energy produced in a year.

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