Code: 9A01402 **R09/SS**

B.Tech II Year II Semester (R09) Supplementary Examinations May/June 2016

HYDRAULICS & HYDRAULIC MACHINERY

(Civil Engineering)

Time: 3 hours Max. Marks: 70

Answer any FIVE questions

All questions carry equal marks

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1 (a) Derive the geometrical conditions for the most economical section of rectangular channel.
(b) Compute the value N of a trapezoidal channel section having bottom width 10 m. y_n = 2.5 m side slope of 2 horizontal to 1 vertical.

2 (a) Derive the dynamic equation of GVF.
(b) A wide rectangular channel 3.75 m^3/s/m width is laid with a break in the bottom slope S_1 to S_2. The slope S_2 is equal to 1 in 500. Determine the location of the jump if the slope S_1 is 1 in 100. Take n = 0.025.

3 (a) What do you mean by dimensionally homogenous equation? Give few examples.
(b) What is meant by hydraulic similarity between a model and prototype?

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) Explain the design specifications of a Pelton wheel.
(b) A Kaplan turbine is provided with a straight conical draft tube of inlet diameter 3 m and outlet diameter 5 m. The inlet is 5 m above the tail race level. The velocity of water at the inlet is 4.8 m/s. The loss of head in the draft tube is equal to one-half the velocity head at outlet. Calculate the pressure of water at inlet and the horsepower lost due to friction in the tube.

6 (a) Define specific speed of a turbine and derive an expression for the same.
(b) What are the different types of governors? Explain them in brief.

7 (a) What do you mean by a pump? Under what conditions would a reaction turbine work as a pump.
(b) A centrifugal pump delivers 300 lps of water against a head of 5 m when running at 510 rpm. At what speed should a geometrically similar pump run when delivering 150 lps at a head of 10 m. Determine the ratio of linear dimensions of the pump.

8 (a) Describe pumped storage plant with a neat sketch.
(b) What are the main points of difference between a differential surge tank and compound surge tank? Discuss the relative advantages of a compound surge tank.

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