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BICE-025

B.Tech. CIVIL ENGINEERING (BTCLEVI)

00993

Term-End Examination

December, 2016

BICE-025 : HYDRAULICS AND HYDRAULIC MACHINES

Time : 3 hours *Maximum Marks : 70*

Note : *Attempt any **five** questions. All questions carry equal marks. Use of scientific calculator is permitted. Assume missing data, if any.*

1. (a) Differentiate between open channel flow and pipe flow. *4*

   (b) What do you understand by rapidly varied and gradually varied flow ? Also give examples. *5*

   (c) Describe specific energy and specific force. *5*

2. (a) Find the discharge through a trapezoidal channel of width 8 m and side slope of 1 horizontal to 3 vertical. The depth of water flow is 2·4 m and Chezy's C = 50. The slope of the channel bed is given as 1 in 4000. *7*

(b) A rectangular channel carries water at a rate of 400 litres/sec. when the bed slope is 1 in 2000. Find the most economical dimensions of the channel, if Chezy's C = 50. *7*

3. (a) The depth of water flow at a certain section of a rectangular channel of 2 m width is 0·3 m. The channel carries a discharge of 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. If no hydraulic jump is possible, give reasons thereof. *8*

(b) Find the rate of change of depth of water in a rectangular channel of 10 m width and 1·5 m depth, when the flow velocity is 1 m/s. The bed slope is given as 1 in 4000 and the energy line has a slope of 0·00004. *6*

4. (a) Describe, in detail, the various important efficiencies of a turbine and why such efficiencies are considered important. *10*

(b) What do you understand by Cavitation ? *4*

5. (a) Differentiate between the Francis and Kaplan turbines and also give their relative advantages and disadvantages over each other. *8*

(b) Describe the constant speed curve of a turbine. *6*

6. (a) A Pelton turbine develops 3000 kW under a head of 300 m. The overall turbine efficiency is 83%. If the speed ratio = 0·46, C_v = 0·98 and specific speed is 16·5, find

(i) the diameter of the turbine, and

(ii) the diameter of the jet. *10*

(b) A turbine develops 9000 kW when running at 140 rpm and under a head of 30 m. Determine its specific speed. *4*

7. Write short notes on the following : $4 \times 3\frac{1}{2} = 14$

(a) Hydraulic Jump

(b) Unit Quantities

(c) Characteristic Curves

(d) Velocity Triangles