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BICE-025

B.Tech. CIVIL ENGINEERING (BTCLEVI)

Term-End Examination

00235 **December, 2014**

BICE-025 : HYDRAULICS AND HYDRAULIC MACHINES

Time : 3 hours *Maximum Marks : 70*

Note : *Answer any **seven** questions. Answers are to be written in English only. Assume missing data if any. Use of calculator is permitted.*

1. (a) What do you understand by flow in open channels ? *2*

(b) What are the different types of flow in open channels ? *2*

(c) Describe any two types of flow in open channels, with suitable examples. *6*

2. (a) Describe Chezy's and Manning's equations for uniform flow in open channels. *2*

(b) Find the bed slope of trapezoidal channel of bed width 4 m, depth of water 3 m and side slope of 2 horizontal to 3 vertical, when the discharge through the channel is 20 m^3/sec. *8*

3. Find the velocity of flow and rate of flow of water through a rectangular channel 6 m wide and 3 m deep, when it is running full. The channel is having bed slope as 1 in 2000. Take Chezy's constant C = 55. *10*

4. Describe the term 'afflux' and the phenomenon of 'backwater curve' in open channel and prove that the length of the backwater curve is given by,

$$L = \frac{E_2 - E_1}{i_b - i_e}$$

where L = length of the backwater curve

E_2 = Specific Energy at the end of backwater curve

E_1 = Specific Energy at the section where water starts rising

i_b = Slope of bed, and

i_e = Slope of the energy gradient. *10*

5. The depth of flow of water, at a certain section of a rectangular channel 2 m wide, is 0·3 m. The discharge through the channel is 1·5 m^3/sec. Determine whether a hydraulic jump will occur; and if so, find its height and loss of energy per kg of water. *10*

6. Write short notes on the following hydraulic turbines :

(a) Constant head curve *6*

(b) Constant speed curve *4*

7. (a) Describe the term 'Governing of a turbine'. *4*

(b) What is the basis of selection of a turbine at a particular place ? *3*

(c) Define the specific speed of a turbine. What is the significance of the specific speed ? *3*

8. A Kaplan turbine develops 33,500 HP at an average head of 39 metres. Assuming a speed ratio of 2, flow ratio of 0·6, diameter of the boss equal to 0·35 times the diameter of the runner and an overall efficiency of 90%, calculate the diameter and speed of the turbine. *10*

9. A centrifugal pump is running at 1000 r.p.m. The outlet vane angle of the impeller is 45° and velocity of flow at outlet is 2·5 m/sec. The discharge through the pump is 200 litres/sec., when the pump is working against a total head of 20 m. If the manometric efficiency of the pump is 80%, determine the

(a) diameter of the impeller *5*

(b) width of the impeller at outlet *5*