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BICE-025

B.Tech. CIVIL ENGINEERING (BTCLEVI)

Term-End Examination, 2019

**BICE-025 : HYDRAULICS AND HYDRAULIC
MACHINES**

Time : Three Hours]

[Maximum Marks : 70

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

1. Explain the following terms : [10]
 - (a) Types of Channel
 - (b) Types of Flow
 - (c) Types of Forces acting on Open channel
 - (d) Hydraulic Mean Depth

2. Derive the condition for maximum discharge for a given value of specific energy. [10]

3. Derive an expression for the discharge through a channel by Chezy'r formula. [10]

4. An irrigation lined canal is trapezoidal in slope with 3H:2V. It carries a discharge of $10\text{m}^3/\text{s}$ on a bed slope of 1 in 5000. Mannings $n = 0.012$. Find the dimension of most economical channel. [10]

5. Show that the expression given below is for wide horizontal rectangular channel, assuming Chezy's C to be constant in a GVF:

$$x = \frac{c^2}{g} \left[y - \frac{y^4}{4y_c^3} \right] + \text{constant.} \quad [10]$$

6. A rectangular channel of 5m wide carries water at depth 1.5m, $S_b = 10^{-4}$, $n = 0.016$ and ends in a canal drop. The depth upstream at some upstream point is 1.4m. Find the type of profile. [10]

7. Show that the equation given below is used in horizontal rectangular channel to create hydraulic jump,

$$y_c^3 = y_1 y_2 \left[\frac{y_1 + y_2}{2} \right]$$

Where y_1, y_2, y_c are depth before the jump, after the jump and critical depth respectively. [10]

8. A rectangular channel carrying supercritical stream is to be provided with a hydraulic jump as energy dissipator. If it is derived to an energy loss of 5m in the jump when inlet $f_{r_1} = 8.5$, determine the sequant depths (y_1 and y_2). [10]

9. (a) Differentiate between Turbines and Pumps. [5]
(b) What do you understand by the characteristic curves of a Turbine ? Name the important types of characteristic curves. [5]

10. A pelton turbine wheel is to be designed for the following specifications : [10]

Power =16,000 BHP; Head=380m

Speed=750 R.P.M ; Overall efficiency=80%

Jet diameter is not to exceed one-sixth of the wheel diameter. Determine :

- (i) The wheel diameter
- (ii) The number of jet required
- (iii) Diameter of the jet