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BICE-025

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B.Tech-VIEP CIVIL ENGINEERING

Term-End Examination

December, 2013

BICE-025 : HYDRAULICS AND HYDRAULIC MACHINES

Time : 3 Hours *Maximum Marks : 70*

Note : *(i) Answer **any seven** questions.*

*(ii) All questions carry **equal** marks.*

*(iii) Use of scientific calculator is **permitted.***

1. What is an open channel ? What are the various types of open channels ? Give examples. What causes the flow in an open channel ? **10**

2. Derive the condition for the trapezoidal channel of best section. Show that the hydraulic mean depth for such a channel is one-half the depth of flow. **10**

3. Derive Chezy's formula for uniform flow through a channel. **10**

4. It is proposed to provide a rectangular channel of best section of area 12.5 m^2. Find the breath and depth. If the bed slope is 1 in 2000. Find the discharge. **10**

Take Chezy's coefficient, $C = 45$.

5. Water flows in a triangular channel of side slope 1 horizontal : 1 vertical and longitudinal slope of 0.001. Determine whether the channel is mild, steep or critical when a discharge of $0.2 m^3/s$ flows through it. Assume Mauning's $n = 0.015$. For what range of depths will the flow be on a type 1, 2 or 3 curve ? **10**

6. A rectangular channel has a width of 1.8m and carries a discharge of $1.8 m^3/s$ at a depth of 0.20m. Calculate (i) the specific energy, (ii) depth alternate to the existing depth and (iii) Froude numbers at the alternate depths. **10**

7. Obtain an expression for the depth after the hydraulic jump and the loss of head due to the jump. **10**

8. A stationary hydraulic jump occurs in a rectangular channel with the initial and sequent depths being equal to 0.20m and 1.2m respectively. Estimate the discharge per unit width and the energy loss. **10**

9. Explain the terms : hydraulic efficiency mechanical efficiency and overall efficiency. 10

10. A Kaplan turbine has a hydraulic efficiency of 90%and a mechanical efficiency of 93%, with a runner diameter of 6 metres and a boss diameter of 1.80 metres. If the discharge of the turbine is $180 m^3/sec$. Calculate the head on the turbine and the shaft power of the turbine. Assume that there is no whirl at outlet and the discharge is free. Neglect losses in the turbine. 10