Printed Pages: 02 **Sub Code: CE403/ ECE403/ NCE403**

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B.TECH
(SEM IV) THEORY EXAMINATION 2018-19
HYDRAULIC AND HYDRAULIC MACHINE

Time: 3 Hours ***Total Marks: 100***

Note: Attempt all Sections. If you require any missing data, choose suitably.

SECTION A

1. Attempt *all* questions in brief. **2 x 10 = 20**

a. Differentiate between uniform and non uniform flow.
b. Explain Non prismatic channel in brief.
c. Define alternate depth in hydraulic channel.
d. Explain the concept of specific energy.
e. Explain hydraulically efficient section.
f. Why NDL is above CDL in case of steep slope?
g. Define hydraulic jump.
h. Derive relation between chezy's and manning's equation.
i. Define control section.
j. Draw GVF profile when flow changes from steep to mild.

SECTION B

2. Attempt any *three* of the following: **10 x 3 = 30**

a. Draw all the profiles which are used in the flow analysis of GVF.
b. A triangular channel has an apex angle 60° and carries a flow with a velocity of 2.0 m/s and depth of 1.25 m. Is the flow subcritical or super-critical? What is the specific energy?
c. What are the three main characteristics of a water turbine? Define unit power, unit discharge and unit speed. Also sketch constant head curves for pelton wheel.
d. In a flow over a certain spillway crest the normal acceleration can be assumed to be constant. Show that the pressure on the crest is atmospheric when an, θ= gcos = inclination of the normal to the surface with theθwhere vertical.
e. Differentiate between open channel positive and negative surge.

SECTION C

3. Attempt any *one* part of the following: **10 x 1 = 10**

(a) Differentiate between open channel flow and pipe flow, show the energy grade line and the hydraulic grade line in both cases
(b) Define the term Reynolds's number and Froude's number. Differentiate between Tranquil and Torrential flow in open channel.

4. Attempt any *one* part of the following: 10 x 1 = 10

(a) A concrete-lined Trapezoidal channel (n = 0.015) is to have a side slope of 1.0 Horizontal: 1 Vertical. The bottom slope is to be 0.0004. Find the bottom width of the channel necessary to carry 100 m3 /s of discharge at a normal depth of 2.50 m

(b) A rectangular Channel Flow has bed slope of 0.001, discharge 1.0m^3/s, with 3m and Manning's coefficient=0.015. Given that the normal depth of flow ranges between 0.76m and 0.8m. Find the minimum width of throat that is possible at a given section while ensuring that the prevailing normal depth does not exceed along the reach upstream of the contraction (assume losses are negligible).

5. Attempt any *one* part of the following: 10 x 1 = 10

(a) Draw and discuss M1 , M3 , S1 and S3 Flow profile.

(b) A 5.0m wide trapezoidal channel having a side slope of 1.5 horizontal: 1 vertical is laid on a slope of 0.00035. The Manning's roughness coefficient=0.015. Find the normal of a discharge of 20m^3/s through this channel.

6. Attempt any *one* part of the following: 10 x 1 = 10

(a) A 3.0 m wide Rectangular channel has a flow of 3.60 m3 /s with a velocity of 0.8 m/s. If sudden release of additional flow at the upstream end of the channel causes the depth to rise by 50 %, determine absolute velocity of the resulting surge and new flow rate.

(b) A Rectangular channel has a width of 2.0 m and carries a discharge of 4.80 m3 /s with a depth of 1.60 m. at a certain section a small, smooth hump with a flat top and of height 0.50 m is proposed to be built. Calculate the likely change in the water surface. Neglect the energy loss

7. Attempt any *one* part of the following: 10 x 1 = 10

(a) What is reciprocating pump? Describe the principle and working of a reciprocating pump with a neat sketch.

(b) A Pelton wheel has a mean bucket speed of 10 meters per second with a jet of water flowing at the rate of 700 liters/s under a head of 30 meters. The buckets deflect the jet through an angle of 160o calculate the power given by water to the runner and the hydraulic efficiency of the turbine. Assume coefficient of velocity as 0.98.

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SECTION B QUESTION 2 (d) MUST BE READ AS:

In a flow over a certain spillway crest the normal acceleration (a_n) can be assumed to be constant. Show that the pressure on the crest is atmospheric when $a_n = g \cos\Theta$,where Θ= inclination of the normal to the surface with the vertical.