Printed Pages : 4

NCE403

(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 100411

Roll No.

# B. Tech.

## (SEM. IV) THEORY EXAMINATION, 2014-15

## HYDRAULICS & HYDRAULIC MACHINES

Time : 3 Hours] [Total Marks : 100

Note : (1) Attempt all questions.

(2) Assume suitable data, if required.

1. Attempt any four parts of the following: 5x4=20

(a) Show that for a rectangular channel with given area is most efficient when hydraulic radius is half of the depth of the flow.

(b) Differentiate between rigid and alluvial channels. Explain dune and antidune bed forms with the help of neat sketches.

(c) Define - Hydraulic mean radius, hydraulic depth, section factor and most efficient channel cross section.

(d) Derive the dynamic equation of gradually varied flow.

(e) On what factors does the Manning's rugosity coefficient depends.

(f) What do you understand by channel of constant velocity. Derive the relevant formula.

2. Attempt any two parts of the following: 2x10 = 20

(a) A wide rectangular channel carries a flow of 2.75 $m^3/s$ per meter width, the depth of flow being 1.5m. Calculate the rise of the floor level required to produce a critical flow condition. What is the corresponding fall in surface level.

(b) What do you understand by specific energy for a flow in open channel. Draw the specific energy diagram and describe its various characteristics.

(c) Define conveyance of a channel. Find the discharge in a trapezoidal channel with a bed width of 10m, side slopes 1:1 and depth of flow of 0.2m under uniform flow condition. Bed slope is $1\times10^{-4}$ and Manning's roughness coefficient = 0.025. Also find Chezy's coefficient at this depth.

3. Attempt any two parts of the following: 2x10 = 20

(a) Sketch the G.V.F. Profile produced on

(i) Mild Slope

(ii) Steep Slope

(iii) Critical Slope

(b) A rectangular channel with a bottom width of 4.0 m and a bottom slope of 0.0008 has a discharge of 1.50 $m^3$ /s. In gradually varies flow in this channel, the depth at certain location is found to be 0.30m. Assuming n = 0.016, determine the type of GVF profile.

(c) Derive the dynamic equation of GVF, state its various assumption, also give the limitation of GVF.

4. Attempt any two parts of the following: **2×10=20**

(a) What do you understand by term "Hydraulic Jump". Discuss the classification of Hydraulic Jump and practical applications of Hydraulic Jump.

(b) A horizontal rectangular channel of constt. Width is fitted with a sluice gate. When the sluice gate is opened, water issues with a velocity of 6 m/s and depth of 0.5 m at the vena contracta. Determine wheather a hydraulic jump will form or not. If so, calculate the energy dissipated.

(c) Hydraulic jump is sometimes used as energy dissipater at the toe of the spillway of a dam, why? Discuss different ways for obtaining the hydraulic jump. Prove that relative height of the jump, depend only on flow corresponding supercritical conditions Froude Number.

5. Attempt any two parts of the following : **2×10=20**

(a) (i) Differentiate between-Impulse and reaction turbine; Radial and axial flow turbine.

(ii) Write a note on characteristics curves for Rotodynamic pumps.

(b) Draw neat sketch of various shapes of draft tubes. Also, explain the theory of draft tube.

(c) A pelton wheel turbine is to be designed for the following specifications :

Shaft power =11775kW

Head = 400 m, Speed = 750 rpm

overall efficiency =86%, jet diameter to wheel diameter ratio is not to exceed one sixth (1/6). Find.

(i) The wheel diameter

(ii) The number of jets required

(iii) Diameter of the jet

Given $Kv_1 = 0.985$ and $Ku_1 = 0.45$

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