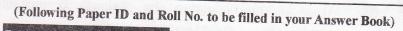
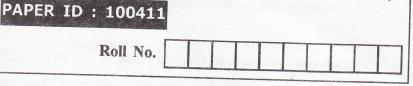
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NCE403





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.

100411]

[Contd...

- (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 m³/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 1×10⁻⁴ 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

100411]

2

[Contd...

- (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: $2 \times 10 = 20$
 - (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 : $2 \times 10 = 20$
 - (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.

100411]

3

[Contd...

(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 $Ku_1 = 0.45$

4

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