



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

PAPER ID : 100403

Roll No.

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B. Tech.

(SEM. IV) THEORY EXAMINATION, 2014-15

HYDRAULICS & HYDRAULIC MACHINES

Time : 3 Hours]

[Total Marks : 100

- Note :
- (1) Attempt all questions.
 - (2) Marks are indicated against each question.
 - (3) Assume any data suitably if not given.

- 1 Attempt any four parts : 5×4=20
- (a) Draw a neat sketch of open channel and show all geometric parameters.
 - (b) Explain following :
 - (i) specific energy in open channel flow.
 - (ii) standing wave flume for flow measurement
 - (c) Design a concrete lined channel to carry a discharge of 500 m^3 at a slope of 1:4000. The side sloper of channel may be taken as 1 H : 1 V. The meanings coefficient for the lining is 0.014. Assume permissible velocity in the section as 2.5 m/sec.

- (d) A 2 m wide rectangular channel has a specific energy of 1.50 m when carrying a discharge of $5\text{m}^3/\text{sec}$. Calculate alternate depth and corresponding Froud no.
- (e) Calculate the critical depth and corresponding specific energy for a discharge of $10\text{ m}^3/\text{sec}$. in following channel :

Rectangular channel B = 5.0 m

Circular channel D = 2.0 m

- (f) Write notes on :
- (i) Critical depth
 - (ii) Methods of measurement of mean velocity by pilot tube.

2 Attempt any two parts : 10×2=20

- (a) A rectangular channel has width of 2.5 m and slope of 1 : 400, Find depth of flow of the discharge is 10 cume/sec. Use Chezy's formula and take $C = 50$.
- (b) Explain following :
- (i) Specific force
 - (ii) Vertical contraction
 - (iii) equivalent roughness
 - (iv) Velocity distribution of smooth channel
- (c) Water flows at a uniform depth of 2 min trapezoidal channel having bottom width 6m, side slope 2 H : 1V of it is to carry a discharge of $65\text{ m}^3/\text{sec}$. compute the bottom slope required to be provided. Take mannings coefficient $n = 0.025$.

- 3 Attempt any two parts : 10×2=20
- (a) What do you mean by gradually varied flow ? Differentiate between channel slope and surface profile. Also explain critical sloped surface profile in open channels.
 - (b) What is flow profile ? Show with diagram steep slope profile.
 - (c) A trapezoidal channel having bottom width 6m, side slope 2H : 1V, $n = 0.025$ and bottom slope 0.0016 carries a discharge of $19 \text{ m}^3/\text{sec}$. Compute the back water profile created by a dam which backs up the water to a depth of 20 m immediately behind the dam. Use direct step method.
- 4 Attempt any two parts : 10×2=20
- (a) What is a hydraulic jump ? When it occurs ? Give types of hydraulic jumps and assumptions in analysis of hydraulic jump.
 - (b) What is conjugate depth. A rectangular channel 10 m wide carries 60 cumec of water. If the energy dissipated in the jump is 4.11 N-m/N , compute the conjugate depth.
 - (c) Explain surges in open channels. Explain procedure for finding location of jump at the toe of spillway.
- 5 Attempt any two parts : 10×2=20
- (a) What are roto dynamic and positive displacement pumps ? Give advantages and disadvantages of centrifugal pump over reciprocating pump.
 - (b) Explain :
 - (i) characteristics of curves of pumps.
 - (ii) Efficiency of turbines.

- (c) A centrifugal pump delivers water against a net head of 14.5 m and design speed of 900 rpm. The vanes are curved back to an angle of 30° with the periphery. The impeller dia is 300 mm and outlet width 500 mm. Determine the discharge of pumping manometric efficiency is 95%.
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