

TCE-401

1029

Even Semester Examination 2018-19

B. Tech. (Civil Engineering) (SEMESTER-IV)

**HYDRAULICS AND HYDRAULIC MACHINE**

Time: 03:00 Hours

Max Marks :100

Note : All questions are compulsory. Draw diagram wherever necessary. All questions carry equal marks.

1. Attempt any **four** parts of the following [5X4=20]
- (A) Explain the difference between open channel flow and pipe flow.
  - (B) Define specific energy. What is specific energy diagram? Draw a typical specific energy diagram and show different stages of flow on it.
  - (C) For a very wide rectangular channel derive the relation for normal depth of flow in terms of Manning's coefficient (N), bottom slope ( $S_0$ ) and discharge intensity (q).
  - (D) Explain incipient motion condition.
  - (E) Explain the use of end depth in estimating discharge through an open channel.
  - (F) Describe classification of hydraulic jumps in rectangular and horizontal channels.
2. Attempt **any four** parts of the following [5X4=20]
- (A) Discuss velocity distribution in open channels
  - (B) Derive the expression for critical depth in a triangular channel having side slope of  $m(H):1 (V)$ .
  - (C) Describe the features of M1 and M2 type gradually varied flow profiles.
  - (D) Describe Shield's curve and explain its use.
  - (E) Describe characteristic curves of centrifugal pumps.

(F) Differentiate between Impulse and Reaction turbines.

3. Attempt any **two** parts of the following [10X2=20]

(A) Describe working of a centrifugal pump and its components including accessories. Draw a neat sketch of a typical centrifugal pump installation.

(B) Derive the equations for bed width, wetted perimeter and hydraulic radius of an hydraulically most efficient trapezoidal section whose side slope is  $m$  (H) : 1 (V) and depth of flow is  $y$ . Then prove that the proportions of a hydraulically efficient trapezoidal channel section will be such that a semicircle can be inscribed in it.

(C) Show that in a triangular channel, the Froude numbers corresponding to alternate depths ( $F_1$  and  $F_2$ ) are given by:

$$\frac{F_1}{F_2} = \frac{(4 + F_1^2)^{5/2}}{(4 + F_2^2)^{5/2}}$$

4. Attempt any **two** parts of the following [10X2=20]

(A) Describe different components and working of a Pelton wheel turbine with neat sketches.

(B) Width of a horizontal, frictionless rectangular channel is suddenly reduced at a section. The flow through the channel is subcritical. Discuss the flow through this transition using the specific energy diagram.

(C) Show that the differential equation of gradually varied flow in a rectangular channel of variable width  $B$  can be expressed as:

$$\frac{dy}{dx} = \frac{S_0 - S_f + \left( \frac{Q^2 y}{gA^3} \left( \frac{dB}{dx} \right) \right)}{1 - \frac{Q^2 B}{gA^3}}$$

5. Attempt any **two** parts of the following [10X2=20]

(A) What is a hydraulic jump? Derive the expression for sequent depth ratio for a classical hydraulic jump.

- (B) A rectangular channel 3.6m wide had badly damaged surface and had manning's  $n = 0.030$ . as a first phase of repair its bed was lined with concrete ( $n = 0.015$ ). if depth of flow remains same at 1.2m before and after the repair , what the percentage increase of discharge obtained as a result of repair?
- (C) What is a surge? What are four different types of surges. Under what conditions they are caused. Write down the equations of continuity and momentum for a positive surge moving downstream in a rectangular channel.

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