

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

Paper ID : 2289950

Roll No.

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## B.TECH.

### Regular Theory Examination (Odd Sem-VII), 2016-17 OPEN CHANNEL FLOW

Time : 3 Hours

Max. Marks : 100

Note: Attempt all Sections If require any missing data; then choose suitably.

#### SECTION - A

1. Attempt all questions in brief. (10×2=20)
- Discuss velocity distribution for rectangular a rectangular open channel.
  - What do you mean by specific force?
  - Explain the term wetted perimeter and hydraulic mean depth.
  - Define hydraulic jump.
  - Define steaming flow, critical flow and shooting flow.
  - Classify surface profiles.
  - What are the applications of hydraulic jump?
  - Define Celerity of a wave.

- i) Draw steep slope profiles.
- j) Differentiate between deep and shallow water waves.

### SECTION - B

#### 2. Attempt any three of the following (3×10=30)

- a) Water is flowing at a critical depth at a section in a triangular shaped channel, with side slope of 0.5H: IV with its apex pointing upwards. If the critical depth is 1.6 m and base width is 3m, estimate the discharge in the channel and the specific energy at the critical depth section.
- b) A rectangular channel with a bottom width of 4 m and a bottom slope of 0.0008 has a discharge of  $1.5\text{m}^3/\text{s}$ . in a gradually varied flow in this channel, the depth at a certain location is found to be 0.3m. Assuming  $n = 0.016$ , determine the type of GVF profile.
- c) In a hydraulic jump taking place in a horizontal apron below an Ogee shaped weir the discharge per unit width is  $0.25\text{ m}^3/\text{s}/\text{m}$  and the energy loss is 2.75 m. Estimate the depths at the toe and heel of the jump.
- d) Derive the differential equation of SVF with increasing discharge with its assumptions.
- e) What do you mean by a culvert? Write down its features and explain different types of inlet and outlet controls in culverts.

## SECTION - C

3. Attempt any one part of the following (1×10=10)

- a) Explain specific energy curve with a neat sketch and also derive critical flow condition for constant discharge.
- b) A compound channel is symmetrical in cross-section and has the following geometric properties. Main channel: trapezoidal cross-section, bottom width = 15m., side slope 1.5 H: IV, bank full depth=3m manning's coefficient = 0.03, longitudinal slope=0.0009.

Flood plains: width 75 m, side slope = 1.5 H: 1 V, manning's coefficient = 0.05, longitudinal slope = 0.0009.

Compute the uniform flow discharge for a flow with a total depth of 4.2 m by using diagonal interface method.

4. Attempt any one part of the following: (1×10=10)

- a) A river 100 m wide and 3m deep has an average bed slope of 0.0005. Estimate the length of GVF profile produced by a low dam which raises the water surface just upstream of it by 1.5m. Assume  $n = 0.035$ .
- b) i) What do you mean by flow profiles? Classify them with neat sketch.

- ii) Derive the basic differential equation of GVF with assumptions.

**5. Attempt any one part of the following: (1×10=10)**

- a) i) 'Hydraulic jump can be used as an energy dissipator'. Discuss with neat sketch.
- ii) What do you mean by surge? Discuss its types.
- b) Derive the equation for motion for gradually varied unsteady flow.

**6. Attempt any one part of the following: (1×10=10)**

- a) Explain bottom racks. Classify different types of flows over bottom racks with neat sketch.
- b) What are the various methods used in profile computation of Spatially Varied flow.

**7. Attempt any one part of the following: (1×10=10)**

- a) Explain the flow in a channel with non-linear alignment with a neat sketch.
- b) What are the factors affecting culvert flow and also give in brief steps for design of culverts.