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B.Tech.

(SEM. VII) THEORY EXAMINATION, 2015-16

OPEN CHANNEL FLOW

[Time : 3 hours]　　　　　　　　[Total Marks : 100]

Note:

i)　Attempt all questions.

ii)　Assume any data suitably if not given.

iii)　Marks are indicated against each question.

Section-A

Attempt all questions:

(10 x 2 =20)

1.　What are subcritical and supercritical flow conditions?

2.　What is compound section? Write any two methods of computations of total discharge in case of compound channels.

3.　Differentiate between steady and unsteady flow, uniform and non-uniform flow.

4.　What do you mean by free over fall. Explain with neat sketches.

5.   What are the practical applications of hydraulic jump?

6.   What are uses of side weirs?

7.   What is the control point? How would you determine the transitional profile?

8.   A sluice has spans a 5.0m inside rectangular channel having steep slope. The discharge flowing is 25m^3/sec and velocity is 4.5 m/sec. Find whether a hydraulic jump can form.

9.   What is super elevation in SVF?

10. Where a culvert is provided?

Section-B

Attempt any five questions: **(5 x10 =50)**

1.   (a) Show that for a hydraulic efficient trapezoidal channel section hydraulic radius, $R = y/2$, where y is the depth of flow.

     (b) A trapezoidal channel has side slopes of 1H: 2V. The bed slope is 1 in 500 with the area of cross-section being 40 m^2. Find the dimensions of the channel if it is most economical. Determine the discharge in the most economical section if C=55.

2.   An over flow spillway in 40.0m high. At the design energy head of 2.5m over the spillway, calculate the sequent depths and energy loss in a hydraulic jump formed on a horizontal apron at the toe of spillway. Neglect energy loss due to flow over spillway face. Take C_d=0.738.

8000   (2)

3. Give examples of channels of non-linear alignment and discuss design consideration under sub-critical flow.

4. Show that the following equation is applicable to a control section where critical depth occurs in a frictionless lateral spillway channel:

$$S_0^2 A_C T_C = 4 â q_*^2$$

5. Explain the following:

   i. Specific force

   ii. Equivalent roughness

   iii. Velocity distribution of smooth channel

   iv. Transitions in open channel

6. Classify bottom racks in term of flow with neat sketches.

Section-C

Attempt any two questions: (2 x15 =30)

1. (a) Derive the differential equation of gradually varied flow in a rectangular channel using energy conservation concept.

   (b) A triangular channel of side slope 1H: 2V having a discharge of 0.25m³/sec. The longitudinal slope of channel is 0.0015 and the manning's coefficient is 0.01, find the flow profile of the channel if the depth was found to be 0.4m.

2. (a) Discuss design consideration and design procedure for a culvert.

   (b) How will you determine that the culvert is hydraulically short and hydraulically long? Give the neat sketches of culvert with outlet unsubmerged condition.

3. (a) Derive the expression for sequent depth ratio.

   (b) Water flows under a sluice gate to discharge in a rectangular channel.

   The following data are available:

   i) Average velocity = 30m/sec,

   ii) Depth of flow = 2.5m.

   Compute:

   (a) Sequent depth

   (b) Height of jump

   (c) Length of jump

   (d) Loss of energy

   (e) Type of jump

   (f) Ratio of Fr_1/Fr_2.

   ——x——