Printed Pages—4 Lib GBTU 6/1/13 VII ECE043

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

PAPER ID : 2691 Roll No. | | | | | | | | | | |

B.Tech.

(SEM. VII) ODD SEMESTER THEORY EXAMINATION 2012-13

OPEN CHANNEL FLOW

Time : 3 Hours *Total Marks : 100*

Note :–Attempt **all** questions. Assume any data suitably if required.

1. Attempt any **four** of the following questions : **(5×4=20)**

   (a) Prove that "For a given specific energy the discharge is maximum at the critical flow".

   (b) Show that at critical flow $E_C = \frac{3}{2} y_c$, where E_c is critical specific energy and y_c is specific depth.

   (c) Show that triangular channel section is most efficient when its central angle is 90°.

   (d) For a rectangular channel, show that Q is maximum at the critical depth when specific force P is constant.

   (e) How will you calculate total discharge in a compound channel ? Explain with example.

   (f) Define : Section factor, Conveyance and differentiate between channel of first kind and channel of second kind.

2. Attempt any **two** of the following questions : **(2×10=20)**

(a) Using the Manning equation obtain the condition for velocity to remain constant for various normal depths for a channel with constant S and n.

(b) Show that the gradually flow equation is reduced to uniform flow formula if $dy/dx = 0$.

(c) Show that the water surface slope S_w of a gradually varied flow is equal to the sum of energy slope S and the slope due to velocity change $\frac{d}{dx}\left(\alpha\frac{V^2}{2g}\right)$.

3. Attempt any **two** of the following questions : **(2×10=20)**

(a) A wide rectangular channel carrying $5.0 m^3/s$ has a bottom slope 0.00266 and Manning's n of 0.015. If the channel is followed by a sudden drop, determine how far upstream from the drop depth of flow will be 2.40 m. Use direct step method.

(b) A spillway, as shown in figure 1, has a flow of 3 m^3/s per meter of width occurring over it. What depth y_2 will exist downstream of the hydraulic jump ? Assume there is no energy loss over the spillway.

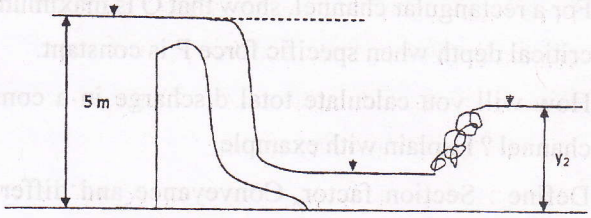

Figure 1

(c) Estimate the energy head loss through the jump.

4. Attempt any **two** of the following questions: **(2×10=20)**

(a) A steady flow occurs in a rectangular channel at a depth of 1.5m and velocity of 2.0m/s. The side of channel are 3.0 high and the channel is 1000 m long. The flow is suddenly stopped at the downstream end by means of a gate. Due to surge produced, will the water spill over the sides ? How much time will be required for the surge to reach the upstream of the channel ?

(b) What is surge in open channel ? Prove celerity of wave 'c' is given by $C \approx \sqrt{gy_1}$, where all symbols have usual meanings.

(c) Discuss the rapid varied flow induced by sudden transition in flow through a non prismatic channel.

5. Attempt any **two** of the following questions : **(2×10=20)**

(a) What do you understand by bottom racks and classify it into different categories ? Discuss various types of flow that can occur over bottom racks and draw its profile also.

(b) A discharge of 11 m^3/s is diverted through ports in the bottom of the channel between sections 1 and 2 as shown in fig 2. Neglecting head losses and assuming a horizontal channel, what depth of water is to be expected

at section 2 ? What channel width at section 2 would be required to produce a depth of 2.5 m ?

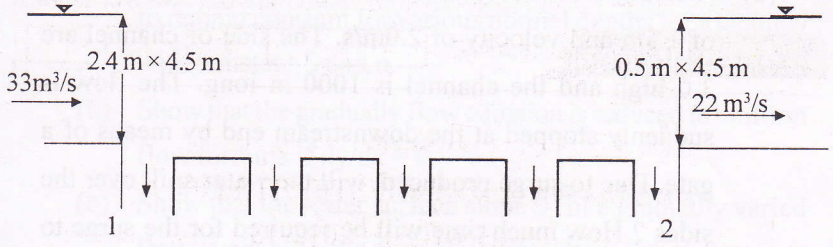

Figure 2

(c) A rectangular concrete conduit is to be used as a culvert on a slope of 0.02. The culvert is 15 m long and has a cross-section of 2.13 m × 2.13 m. If the tail water elevation is 1.8 m above the crown at the outlet, determine the head water elevation necessary to pass a 10 m_3/s discharge. Assume a square-edged entrance (K_e = 0.5).