Paper Id: 100728 Sub Code: NCE 043 / ECE 043 Roll No. [ ]

B.TECH.
(SEM VII) THEORY EXAMINATION 2018-19
OPEN CHANNEL FLOW

Time: 3 Hours ***Total Marks: 100***

Note: 1. Attempt all Sections. If require any missing data; then choose suitably.

SECTION A

1. Attempt *all* questions in brief. **2 x 10 = 20**

a. Define varied flow with neat sketches.
b. What are prismatic channels.
c. Discuss velocity distribution in an open channel flow.
d. Define between GVF and RVF
e. Explain the term hydraulic jump.
f. Describe the Chezy's equations for uniform flow in open channel.
g. What are the difference between closed and open channel flow?
h. Explain the term celerity of wave.
i. Define critical depth in open channel
j. What is meant by design head for spillway.

SECTION B

2. Attempt any *three* of the following: **10 x 3 = 30**

a. A rectangular channel b=2.6 m carries a flow at a velocity of 0.98m/s and at a depth of 1.35 m, if at some location, its width is reduced by half and also its bed is raised by 0.40 m. What happens to the upstream depth of flow ?
b. What do we mean by th maximum discharge through a channel at : (i) A given specific energy (ii) A given specific force.
c. Giving a sketch derive the governing equation of water surface profile in a non-uniform flow explain with neat sketches.
d. A river an average bed slope of 0.00048 , bed width=110m carries a flow at a depth of water to 5m , immediately behind itself. Calculate the length of the water surface profile that is developed using suitable intervals . Take n=0.029.
e. What are the assumptions used for driving the Dynamic equation of gradually varied flow.

SECTION C

3. Attempt any *one* part of the following: **10 x 1 = 10**

(a) A flow of 100 lit/sec in a rectangular channel of width 0.6m and having adjustable bottom slope . If Chezy's c is 56. Determine the bottom slope necessary for uniform flow with a depth of flow 0.3m . Also find the conveyance and the state of flow.
(b) Calculate the specific energy , critical depth and velocity for the flow of 10 m^3/s in a cement lined rectangular channel 2.5 m wide with 2 m depth of water. Is the given subcritical or super critical?

4. **Attempt any *one* part of the following:** **10 x 1 = 10**

(a) A rectangular channel section is to have critical flow and at the same time the wetted perimeter is to be minimum. Show that these two conditions to occur simultaneously, the width of the channel must be equal to 8/9 times the minimum specific energy level.

(b) A short reach of 2 m wide rectangular open channel has its bed levl rising in the direction of flow at a slope of 1 in 10,000, it carries a discharge of 4m3/s and Manning's roughness coefficient in 0.01. the flow in this reach is gradually varying .At a certain section in this reach, the depth of flow is 0.5m . Compute the rate of change of water depth with distance at this section .Assume g=10m/sec^2.

5. **Attempt any *one* part of the following:** **10 x 1 = 10**

(a) Derive the expression for the most economical depth of flow of water in terms of the diameter of the channel of circular section . (i) For maximum velocity (ii) For maximum discharge

(b) An overflow spillway has its crest at an elevation of 125.4 and horizontal apron at an elevation of 95 m take coefficient of discharge of the spillway as 0.735. if the elevation of energy line at upstream is 127.9. compute the tail water elevation to form a hydraulic jump at down stream of the spillway . Neglect energy loss over the spillway.

6. **Attempt any *one* part of the following:** **10 x 1 = 10**

(a) A very wide rectangular channel carries of 8 m^2/s per m width. the channel has a bed slope of 0
004 and manning's roughness coefficient of 0.05. At a certain section, the flow depth is 1 m. Compute the length of water surface profile to a section with flow depth of 0.9m .Use direct step method employing single step.

(b) What do you mean by 'hydraulically efficient channel section'? Explain in detail

7. **Attempt any *one* part of the following:** **10 x 1 = 10**

(a) What is break water? how is it classified? Explain one in detail .

(b) A rectangular flume 2m wide carries discharge at the rate of 2 cumecs. The bed slope of the flume is 0.0004. At certain section the depth of flow is 1m.
Calculate the distance of the section downstream where the depth of flow is 0.9m. Solve by single step method. Assume rugosity coefficient as 0.014. Is the slope of the channel mild or steep? How is this type of surface profile classified