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M.E. (Civil) (Water Resources & Environmental Engineering)
OPEN CHANNEL HYDRAULICS
(2013 Course) (Semester - II) (501088)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

1) *Answer any five questions*
2) *Neat diagrams must be drawn wherever necessary*
3) *Figures to the right indicate full marks*
4) *Use of logarithms tables, slide rule, electronics pocket calculator is allowed*
5) *Assume suitable data if necessary*

Q1) a) Derive for a trapezoidal channel section of most economical section **[4]**

    i) half the top width = length of the sloping side

    ii) hydraulic radius = ½ the depth of flow

   b) State the characteristics of M_2 and S_2 profiles. Give examples of their occurrence. **[6]**

Q2) a) Explain behaviour of slope of water surface profile (dy/dx) at certain key depths. **[4]**

   b) Starting from basic principles derive an expression for GVF for a wide rectangular channel in the form **[6]**

$$\frac{dy}{dx} = S_o \frac{1 - \left(\dfrac{y_n}{y}\right)^{10/3}}{1 - \left(\dfrac{y_c}{y}\right)^3}$$

Q3) a) Mention the types of jumps based on the basis of Froud number. **[2]**

   b) At a certain section M in a rectangular channel of bed width 2 m, depth of flow is 1.2 m. When the rate of flow is 6 m³/s estimate the distance from M to another section N where the depth is 1.4 m. The bed slope is 0.002 and Manning's n = 0.015. Take two steps. Sketch and classify the profile. **[8]**

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Q4) a) Derive equation for ratio of sequent depths for hydraulic jump on sloping floor. **[5]**

b) Explain the standard step method for GVF computation. **[5]**

Q5) a) Explain any three SVF profiles on bottom racks with sketches. **[6]**

b) Explain types of surges. **[4]**

Q6) a) Derive dynamic equation of spatially varied flow with decreasing discharge. **[4]**

b) Derive general equation for absolute velocity of uniformly progressing wave in rapidly varied unsteady flow. **[6]**

Q7) a) Explain bed forms. **[4]**

b) What is flood routing? Distinguish between reservoir routing and channel routing. **[6]**

Q8) a) Describe Kennedy's theory for the design of irrigation channel in alluvial soil. **[4]**

b) For the following flood hydrograph through a river reach for which K = 12 h and x = 0.20 find the discharge for first two time steps. At the start of the inflow flood the outflow discharge is 10 m³/s. **[6]**

Time (h)	0	6	12	18	24	30	36	42	48	54
In flow m³/s	10	20	50	60	55	45	35	27	20	15

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