

[5060] - 556

M.E. (Civil) (Water resources and Environmental Engg)

OPEN CHANNEL HYDRAULICS

Water resources and Environmental Engg

(2013 Pattern)

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
(i) half the top width = length of the sloping side (ii) hydraulic radius = $\frac{1}{2}$ the depth of flow [4]

b) Explain the characteristics of M_1 profile and state one example of its occurrence [6]

Q2) a) Describe constriction in width of channel for upstream flow subcritical [6]

b) Starting from basic principles derive an expression for GVF for a wide rectangular channel in the form [4]

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

- Q3)** a) Write a short note on control of hydraulic jump by jump at an abrupt drop [6]
 b) Write a short note solution of GVF equation using Chow's method [4]
- Q4)** a) 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]
 b) Enumerate types of hydraulic jump [2]
- Q5)** a) Explain any two SVF profiles on bottom racks with sketches [6]
 b) Derive dynamic equation of gradual varied unsteady flow [4]
- Q6)** a) Derive dynamic equation of spatially varied flow with decreasing discharge [5]
 b) Derive equation for celerity of a solitary wave [5]
- Q7)** a) Define condition of incipient motion? Write in brief of Shields' analysis [5]
 b) What is flood routing? Distinguish between reservoir routing and channel routing [5]
- Q8)** a) Define bed load, saltation load, suspended load, total load [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
Inflow m ³ /s	10	20	50	60	55	45	35	27	20	15

