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ELECTIVE - I
Open Channel & Conduit Flow (Old)
(1045)

P. Pages : 3

Time : Three Hours **Max. Marks : 100**

Instructions to Candidates :
1. Do not write anything on question paper except Seat No.
2. Answer sheet should be written with blue ink only. Graph or diagram should be drawn with the same pen being used for writing paper or black HB pencil.
3. Students should note, no supplement will be provided.
4. Answer **any one** question from each of five units.
5. Each question carries 20 marks.
6. Figures to the right indicate full marks.
7. Assume suitable data if necessary.
8. Use of non-programmable calculator is allowed.

UNIT – I

1. a) Calculate the critical depth & the corresponding specific energy for a discharge of $5 m^3/s$ in the following channels. **12**

i) Trapezoidal Channel, B = 2 m, m = 1.5

ii) Circular Channel, D = 2 m.

b) A wide rectangular channel carries a flow of 2.76 m^3/s per meter width, the depth of flow being 1.524 m. Calculate the minimum rise in the flow at a section required to produce critical flow. **8**

2. a) A 3.6 m wide rectangular channel carries water at a depth 1.8 m. In order to measure a discharge in channel, width is reduced to 2.4 m & hump of 0.3 m is provided at bottom. Calculate the discharge if the water surface in contracted section drops by 0.15 m. Assume there is no losses. **10**

b) A trapezoidal channel with side slope 2H : 1V has to be designed to carry 15 m^3/s at a bed slope of 1 in 5000. Determine the dimensions of the efficient section. Assume Manning's n = 0.014. **10**

UNIT – II

3. a) Define Gradually varied flow in open channel. Describe, with neat sketches, the possible GVF profiles in a mild slopped channel. Give one practical example of each type. **10**

b) A rectangular channel, 10 m wide, carries water at a rate of 12 m^3/s. Bed slope is 1 in 5000. Manning's n = 0.02. Find the slope of water surface with respect to horizontal at a section in the GVF where the depth of flow is 1m. **10**

4. A small stream has cross section which can be approximated by a trapezoid. The cross sectional properties at three sections are as follows : **20**

Section	Distance up the river (km)	Bed elevation (m)	Bed width (m)	Side slope
A	100.00	100.00	14.0	1.5 : 1
B	102.00	100.80	12.5	1.5 : 1
C	103.50	101.40	10.0	1.5 : 1

Section A is the downstream most section. For a discharge of 100 m^3/s in the stream, water surface elevation at A was 104.500 m. Estimate the water surface elevation at upstream section B & C. Assume n = 0.02 & $\alpha = 1.0$ at all sections.

UNIT – III

5. a) A sluice gate discharge 2.2 $m^3/s/m$ into a wide horizontal channel. At vena contracta the depth is 0.16m. The tail water depth is 2m. Determine the location of hydraullic jump. Assume manning's n = 0.02. **10**

b) Give the classification of hydraulic jump. Derive the equation of energy loss in hydraulic jump formed in rectangular horizontal frictionless channel. **10**

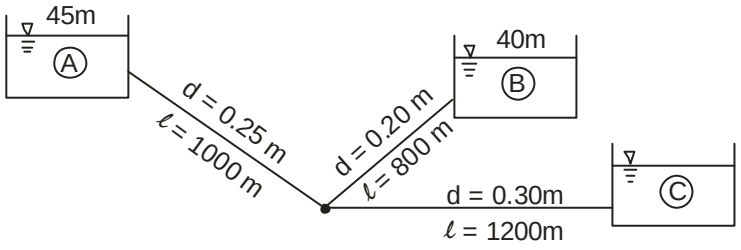
6. a) A rectangular channel 1.8m wide carries water at a velocity of 2.1 m/s & at a depth of 1.2m. The rate of inflow at the upstream end is suddenly increased such that the depth is doubled in magnitude. Calculate the new discharge and the absolute velocity of the resulting surge. **10**

b) A tidal river flows towards the sea at a velocity of 3.6 km/h with a depth of 1.5m. A tidal bore moves upstream and increases the depth to 4m. Calculate the speed of the bore. Also find speed & direction of flow after passage of the bore. **10**

UNIT – IV

7. Three reserviors A, B & C are connected by a pipe system as shown in figure. If the discharge from reservior A is 0.05 cumec, determine the rate of flow into or from the reservior B & C. Also, find R.L. of water level in reservior C. Take f = 0.008. **20**

Reservior →	A	B	C
Dia. of pipe (m)	0.25	0.20	0.30
Length of pipe (m)	1000	800	1200
Elevation (m)	45	40	?
Discharge (cumec)	0.05	?	?



Figure

8. A economical diameter of the pure water rising main of the water supply system for a town is to be determined. **20**

i) What input data will require? Enlist minimum 15 input parameters.

ii) Give the design steps for finding economical diameter.

UNIT – V

9. a) What is meant by surge tank? Where & why it is provided? Explain any two types of surge tanks. **10**

b) A simple cylindrical surge tank is provided on a penstock of diameter 3m at a distance of 1.5km from the reservior. The power plant develops 500kw power under a head of 60m with an overall efficiency of 75%. Find the diameter of surge tank if the maximum upsurge is to be limited to 8m above the reservior water level for penstock, f = 0.018. **10**

10. a) What is celerity of pressure wave? State equations for it, for elastic & rigid pipe. Derive the equation for celerity of pressure wave in rigid pipe. **10**

b) In a pressure penstock 4500m long, water is flowing at 4m/s. If the velocity of pressure wave travelling in the pipe due to sudden complete closure of a valve at the downstream end is given as 1500 m/s. Find the maximum pressure rise and the period of oscillation. Neglect the friction losses. **10**

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