

Registration No :

--	--	--	--	--	--	--	--	--	--

Total Number of Pages : 02

Course: B.Tech  
Sub\_Code: RCI6C002

6<sup>th</sup> Semester Regular/Back Examination: 2022-23  
SUBJECT: Hydrology & Irrigation Engineering  
BRANCH(S): CIVIL Engineering  
Time: 3 Hour  
Max Marks: 100  
Q.Code: M061

Answer Question No.1 (Part-1) which is compulsory, any eight from Part-II and any two from Part-III.

The figures in the right hand margin indicate marks.

Part-I

Q1 Answer the following questions: (2 x 10)

- What are the factors that affect runoff hydrographs?
- What is the probable maximum flood and design flood?
- What are the phreatic line and flow net?
- What are the flow mass curve and mass curve of rainfall?
- What are different types of rain gauge?
- Differentiate between GCA and CCA. Also, define the intensity of irrigation.
- What is the significance of duty, and mention two measures to improve duty?
- What is a divide wall, and what is its function of it?
- Define field capacity and permanent wilting point.
- What is the difference between high and low dams?

Part-II

Q2 Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve) (6 x 8)

- What methods are available to estimate evaporation losses from surfaces and large water bodies? Discuss any one approach suitably.
- With a neat sketch, describe the hydrologic cycle and all the processes involved.
- The mass curve of an isolated storm in a 500-ha watershed is as follows:

Time from the start (h)	0	2	4	6	8	10	12	14	16	18
Cumulative Rainfall (cm)	0	0.8	2.6	2.8	4.1	7.3	10.8	11.8	12.4	12.6

If the direct runoff produced by the storm is measured at the outlet of the watershed as 0.34 millionm<sup>3</sup>, estimate the storm's phi-index and duration of excess Rainfall.

- The following are the ordinates of the hydrograph of flow from a catchment area of 800 km<sup>2</sup> due to a 6-h rainfall. Derive the ordinates of the 6-h unit hydrograph. Make suitable assumptions regarding the base flow.

Time (h)	0	6	12	18	24	30	36	42	48	54	60	66	72
Discharge (m <sup>3</sup> /s)	40	65	215	360	400	350	270	205	145	100	70	50	42

- e) A stream has flood peaks of 1200 m<sup>3</sup>/s and 1060 m<sup>3</sup>/s for the return periods of 100 and 50 years, respectively, using the Gumbel method for a dataset spanning 30 years. Find (i) mean and standard deviation; and (ii) flood peak corresponding to a return period of 500 years.
- f) With neat sketch, explain different techniques of irrigation adopted in India.
- g) Distinguish between the following:  
 (i) Weir and barrage  
 (ii) Water conveyance and water distribution efficiency
- h) Explain the cost-benefit analysis carried out in justifying the lining of the canal.
- i) Draw the layout of diversion head works and briefly discuss the different components.
- j) What are canal falls? Discuss with neat sketches the various types of canal falls.
- k) Describe different modes of failures of concrete gravity dams with criteria for structural stability.
- l) After how many days a crop will be required to supply water to have sufficient irrigation with the following data: The field capacity of the soil = 34%, Permanent wilting point = 15%, Dry unit weight of soil = 11 kN/m<sup>3</sup>, Effective depth of root zone = 850 cm, Daily consumption of water for the given crop = 14 mm.

### Part-III

#### Only Long Answer Type Questions (Answer Any Two out of Four)

- Q3 (a) Determine the best values of the parameters of Horton's infiltration capacity equation for the following data on soil infiltration tests using a double-ring Infiltrometer. (8)

Time since start(minutes)	5	10	15	25	40	60	75	90	110	130
Cumulative Infiltration (mm)	21.0	36.0	47.6	56.9	63.8	69.8	74.8	79.3	87.0	92.0

- (b) What is the consumptive use of a crop? Explain the Blaney-Criddle equation for consumptive use. Compare it with Penman's equation. (8)
- Q4 (a) The rating curve of a current meter is given by  $v=0.51N_s+0.03$  m/s, where  $N_s$  is the revolution per second. Find discharge if the current meter reading is shown in the Table below. (8)

Distance from left (m)	0	1.0	3.0	5.0	7.0	9.0	11.0	12.0
Depth (m)	0	1.1	2.0	2.5	2.0	1.7	1.0	0
No. of Revolution	0	39	58	112	90	45	30	0
Time (s)	0	100	100	150	150	100	100	0

- (b) Discuss sub-surface drainage. Also, describe the causes and controls of water logging. (8)
- Q5 (a) Write the difference between Kennedy's and Lacy's theory for designing a stable channel. (8)
- (b) Design a triangular concrete-lined channel to carry a discharge of 20 cumecs at a slope of 10 cm/km. The side slope of the channel is 1.25:1. Consider Manning's roughness coefficient (n) is 0.03. (8)
- Q6 (a) With neat sketches, discuss all types of cross-drainage works. Also, classify different types of aqueducts based on the materials used in construction. (8)
- (b) With neat sketches, describe any two types of spillways. (8)