

Seventh Semester B.E. Degree Examination, Feb./Mar. 2022
Hydrology and Irrigation Engineering

Time: 3 hrs.

Max. Marks: 80

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- 1 a. With a neat sketch, explain Qualitative representation of Hydrologic cycle. (08 Marks)
b. The annual rainfalls at 7 rain gauge stations in a basin are 58, 94, 60, 45, 20, 88 and 68cm respectively. What is the percentage accuracy of the existing network in the estimation of the average depth of rainfall over the basin? How many additional gauges are required if it is desired to limit the error to only 10%? (08 Marks)

OR

- 2 a. Discuss the various practical applications of hydrology. (08 Marks)
b. Neighbouring rain gauge stations A, B, C, D, E and F have normal annual rainfalls of 610, 554, 468, 606, 563 and 382mm respectively. During a storm, stations B, C, D, E and F have reported rainfalls of 22, 29, 35, 13 and 25mm respectively and station A did not report as it was inoperative. Estimate the missing storm rainfall at A by the Arithmetic Average method and the Normal – Ratio Method. (08 Marks)

Module-2

- 3 a. Explain the process of Evaporation. Discuss the various factors affecting evaporation. (08 Marks)
b. The accumulated average rainfall over a basin of area of 50 hectares during a storm was as follows :

Time from beginning of the storm (h)	0	1	2	3	4	5	6	7
Accumulated Average rainfall (mm)	0	6	17	51	79	91	97	97

If the volume of runoff from this storm was measured as $25 \times 10^3 \text{ m}^3$, determine the ϕ - index for the storm. Also show in graph also. (08 Marks)

OR

- 4 a. Explain Meyer's and Rohwer's equation used for estimating evaporation. (08 Marks)
b. The average water spread areas that are likely to be maintained during the operation of a reservoir after its completion and the observed monthly pan evaporation at a proposed reservoir site are given below.

Month	Jan	Feb	Mar	April	May	June	July	Aug	Sept	Oct	Nov	Dec
Average water spread area in hectares	872.0	797.0	754.5	739.5	726.0	717.5	735.0	765.0	807.5	850.0	891.0	917.0
Pan Evaporation in cm	10.2	15.3	25.4	30.5	28.0	17.8	15.3	14.0	14.0	15.3	12.7	10.2

Estimate the annual evaporation loss from the reservoir in million m^3 . If 75% of this loss can be prevented and the water thus saved is utilized to irrigate a crop with a requirement of 57cm of water. How much area can be irrigated? Assume a pan co-efficient of 0.70.

(08 Marks)

Module-3

- 5 a. What are the factors affecting run – off? Explain briefly any two factors. (08 Marks)
 b. Define Unit hydrograph. What are the assumptions underlying the Unit hydrograph theory? (08 Marks)
 What are the uses of Unit hydrograph?

OR

- 6 a. Describe the step by step procedure of the derivation of a unit hydrograph from an isolated storm. (08 Marks)
 b. Ordinates of 4h unit hydrograph are given below. Derive 8h unit hydrograph.

Time (h)	0	2	4	6	8	10	12	14	16
Ordinates of U.H (m ³ /s)	0	12.52	21.32	23.54	17.84	14.79	12.18	10.04	8.26

Time (h)	18	20	22	24	26	28	30	32	34
Ordinates of U.H (m ³ /s)	6.51	4.98	3.95	3.05	2.26	1.60	1.07	0.53	0

(08 Marks)

Module-4

- 7 a. Define Irrigation. Explain the necessity of irrigation in a tropical country like India. Discuss the advantages and ill effects of Irrigation. (08 Marks)
 b. What are the factors affecting duty? How can duty be improved? (08 Marks)

OR

- 8 a. Explain Bandhara irrigation, with neat sketch. Discuss the advantages and disadvantages of Bandhara system. (10 Marks)
 b. Define Duty, Delta and Base period. Derive the relationship between them. (04 Marks)
 c. Find the duty of paddy crop which is having base period 120 days and delta of 1200mm. (02 Marks)

Module-5

- 9 a. What are the different ways in which the irrigation canals can be aligned? Explain them with neat sketch. (06 Marks)
 b. Explain the method of calculating reservoir capacity for a specified yield, from the mass inflow curve. (10 Marks)

OR

- 10 a. Using Lacey's theory, design a Channel section for the following data :
 Discharge : $Q = 30$ cumecs , Silt factor $f = 1.00$, Side slope : $\frac{1}{2} H : 1V$.
 Find also the longitudinal slope. And write down the step by step procedure for channel design. (10 Marks)
 b. Write a short note on "Economic height of a dam". (06 Marks)
