



# CBCS SCHEME

18CV63

Sixth Semester B.E. Degree Examination, Dec.2024/Jan.2025

## Hydrology and Irrigation Engineering

Time: 3 hrs.

Max. Marks: 100

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

### Module-1

- 1 a. What is hydrology? State its importance. (05 Marks)
- b. Write short notes on :
  - i) Moving average curve
  - ii) Mass curve
  - iii) Rainfall hyetograph. (05 Marks)
- c. Define principle of rain gauge. Explain how amount of rainfall is measured using non-automatic type rain gauge with neat sketch. (10 Marks)

OR

- 2 a. What is precipitation? Classify also explain how consistency of rainfall data is checked using "Double mass curve" technique. (10 Marks)
- b. The average annual rainfall of 5 rain gauge station in a basin are 89, 54, 45, 41 and 55 cm. If the error in the estimation of basin rainfall should not exceed 10%, how many additional rain gauges should be installed in the basin? (05 Marks)
- c. Explain how to compute mean rainfall amount of any catchment area using 'Thiessen polygon method'. (05 Marks)

### Module-2

- 3 a. Define evaporation. Explain factors affecting it. Also write Meyer's and Rohwer's equation to estimate its amount. (10 Marks)
- b. What is infiltration? Draw infiltration capacity curve. Also explain its measurement using "Double ring infiltrometer" with neat sketch. (10 Marks)

OR

- 4 a. Define following terms :
  - i) Consumptive use
  - ii) AET
  - iii) PET. Also write Blaney criddle equation to estimate ET. (07 Marks)
- b. What are infiltration indices? Explain  $\phi$  - index and w-index. (07 Marks)
- c. Explain reservoir evaporation and its control. (06 Marks)

### Module-3

- 5 a. What is runoff? Explain factors affecting runoff. (06 Marks)
- b. Explain base flow separation methods with neat sketch. (06 Marks)
- c. Define hydrograph. With neat sketch, explain its components. (08 Marks)

OR

- 6 a. Annual rainfall and runoff values (in cm) of a catchment spanning a period of 21 years are given below. Analyse the data to develop a linear correlation equation to estimate annual runoff volume for a given annual rainfall value.

Year	Annual rainfall (cm)	Annual runoff (cm)	Year	Annual rainfall (cm)	Annual runoff (cm)
1975	118	54	1986	75	17
1976	98	45	1987	107	32
1977	112	51	1988	75	15
1978	97	41	1989	93	28
1979	84	21	1990	129	48
1980	91	32	1991	153	76
1981	138	66	1992	92	27
1982	89	25	1993	84	18
1983	104	42	1994	121	52
1984	80	11	1995	95	26
1985	97	32			

(10 Marks)

- b. A 3-hour duration unit hydrograph has the following ordinates :

Time (hrs)	0	3	6	9	12	15	18	21	24	27	30
Discharge (cumecs)	0.0	3.08	4.94	8.64	9.88	7.41	4.94	3.70	2.47	1.23	0.0

Develop a unit hydrograph of 6 hour duration.

(06 Marks)

- c. What is S-curve? Explain with neat sketch.

(04 Marks)

**Module-4**

- 7 a. Define irrigation state benefits and ill effects of irrigation. (06 Marks)
- b. Define duty, delta and base period. Derive relationship between them. (07 Marks)
- c. Write a note on :  
 i) Irrigation efficiency  
 ii) Frequency of irrigation. (07 Marks)

OR

- 8 a. Differentiate between flow irrigation and lift irrigation. Also explain bhandhara irrigation. (08 Marks)
- b. Explain factors affecting duty of water. (05 Marks)  
 The GCA of an irrigation project is 1.5 lakh hectares. Where 7500 hectares are unculturable.
- c. The area of kharif crop is 60,000 hectares and that of rabi crop is 40,000 hectares. The duty of kharif is 3000 hect/cumec. The duty of rabi is 4,000 hect/cumec. Find :  
 i) The design discharge of the channel assuming 10% transmission loss  
 ii) Intensity of irrigation for Kharif and rabi. (07 Marks)

**Module-5**

- 9 a. Define the following terms : i) GCA ii) CCA iii) II iv) Time factor v) crop factor. (05 Marks)
- b. What is reservoir? With neat sketch explain different storage zones of reservoir. (07 Marks)
- c. Write a note on : i) unlined and lined canal ii) Economical height of dam. (08 Marks)

**OR**

- 10 a. Design a channel by Kennedy's theory when  $Q = 15 \text{ m}^3/\text{sec}$ ,  $N = 0.0225$ ,  $\frac{B}{D} = 7$ , side slope  $\frac{1}{2} + 1$  to 1V and CVR (m) = 1. (10 Marks)
- b. Explain how storage capacity of reservoir is determined using mass curve. (10 Marks)

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