R20

SET - 1

III B. Tech II Semester Regular Examinations, July -2023
WATER RESOURCE ENGINEERING
(Civil Engineering)

Time: 3 hours   Max. Marks: 70

Answer any **FIVE** Questions **ONE** Question from **Each unit**
All Questions Carry Equal Marks
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UNIT-I

1. a) Define irrigation. Discuss the necessity and importance of irrigation. [7M]
    b) Describe with the help of a diagram various forms of a soil moisture. What do you understand by the available moisture? [7M]

(OR)

2. a) What is water logging? Discuss the causes of water logging. [7M]
    b) A certain crop is grown in an area of 3000 hectares which is fed by a canal system. The data pertaining to irrigation are as follows:- Field capacity of soil=26%, Optimum moisture =12%, Permanent wilting point =10%, Effective depth of root zone=80cm, Relative density of soil = 1.4. If the frequency of irrigation is 10 days and the overall efficiency is 23% find (i) the daily consumptive use (ii) the water discharge is m^3/sec required in the canal feeding the area. [7M]

UNIT-II

3. a) What is canal lining? What are its advantages? [4M]
    b) Describe kennedy's silt theory. A channel is silting badly in the head reach how would you proceed to determine its cause and what remedies would you suggest. [10M]

(OR)

4. a) Discuss in brief various causes of failure of weirs and their remedies. [7M]
    b) An impervious floor of a weir on permeable soils is 16m long and has sheet piles at both the ends. The upstream pile is 4m deep and the down stream pile is 5m deep. The weir creates a net head of 2.5m, neglecting the thickness of the weir floor, calculate the uplift pressures at the junction of the inner faces of the pile with the weir floor, by using Khosla's theory. [7M]

UNIT-III

5. a) Describe the hydrologic cycle. Explain briefly the man's interference in various parts of their cycle. [7M]
    b) What is meant by probable maximum precipitation (PMP) over a basin? Explain how PMP is determined. [7M]

(OR)

6. a) Explain the types of automatic rain gauges. [8M]
    b) A catchment has five rain gauge stations. In a year, the annual rainfall recorded by the gauges are 78.8 cm, 90.2 cm, 98.6 cm, 102.4 cm and 70.4 cm. For a 6% error in the estimation of the mean rainfall, determine the additional number of gauges needed. [6M]

UNIT-IV

7. a) Explain the various factors affecting the evapotranspiration process. [7M]
    b) Explain briefly the infiltration process. [7M]

(OR)

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8. a) What is a flow duration curve? What information can be gathered from a study of the flow duration curve of a stream at a site?   [7M]

    b) The rate of rainfall for successive 30 minutes periods of a 4-hour storm are as follows: - 3.5, 6.5, 8.5, 7.8, 6.4, 4.0, 4.0, 6.0, cm/hr. taking a value of ǿ index as 4.5 cm/hr compute the following (i) total rainfall (ii) total rainfall excess and (iii) w_i.   [7M]

UNIT-V

9. What is a unit hydrograph and their assumptions. Describe in detail the derivation of unit hydrograph.   [14M]

(OR)

10. a) What is an IUH? What are its characteristics?   [7M]

    b) For a catchment of 8.6 km2 area, the mass curve of rainfall of 4 hours storm is given below. Determine the effective rainfall hyetograph and the volume of direct runoff from the catchment due to the above storm, taking ǿ-index for the catchment as 0.8 cm/hour.   [7M]

Time from start of storm (h)	0	0.5	1	0.5	2	2.5	3	3.5	4
Accumulated rainfall (cm)	0	0.4	1.1	2.3	3.8	4.8	5.6	6.2	6.7
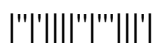
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UNIT-I

1. a) Write a note on scope and importance of irrigation. [7M]
    b) Explain the terms duty and delta relationship between the two. [7M]

(OR)

2. a) What do you understand by land drainage? Discuss the benefits of drainage. [7M]
    b) The discharge available from a tube-well is 120m^3/hour. Assuming 3200 hours [7M]
       of working for a tube-well in a year, estimate the culturable area that this tube-
       well can command. The intensity of irrigation is 50% and the average depth of
       Rabi and Kharif crops is 48cm.

UNIT-II

3. a) Explain various types of canals, according to various classification systems. [7M]
    b) Describe the method of designing a canal based on lacey's regime theory, [7M]

(OR)

4. a) Describe in brief, the various the various types of weirs. [7M]
    b) A weir across an alluvial river has horizontal floor of length 60m and retains [7M]
       6m of water under full pond condition. If the downstream sheet pile is driven to
       a depth of 6m below the average bed level, calculate the exit gradient. Further,
       assuming a porosity of 30% and the relative density of soil particles as 2.70,
       estimate the critical exit gradient and the factor of safety of the system with
       respect to the exit gradient.

UNIT-III

5. a) Define hydrology. Discuss the various applications in engineering. [7M]
    b) What do you understand by precipitation? Explain types of precipitation. [7M]

(OR)

6. a) Describe in detail the methods of presentation rainfall data. [7M]
    b) The ordinates (in mm) of a rainfall mass curve for a storm, which commenced [7M]
       at 06.30 hours, recorded by self-recording raingauge at 15 minutes interval area
       as under. 0, 12.4, 22.1, 35.1, 63.7, 81.9, 109.2, 123.5, 132.6, 143.3, 146 and
       146 construct the hyetograph of this storm for a uniform interval of 15 minutes.
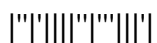
UNIT-IV

7. a) Explain briefly the evaporation process. [7M]
    b) Discuss the factors affecting infiltration capacity curve. [7M]

(OR)

8. a) What is run off? What are the factors that affect the run off from a catchment [7M]
       area?
    b) Discharges in a river are considered in 10 class intervals. Three consecutive [7M]
       years of data of the discharge in the river are given below. Draw the flow-
       duration curve for the river and determine the 75% dependable flow.

Discharge range (m3/s)	<6	6.0-9.9	10-14.9	15-24.9	25-39	40-99	100-149	-150 249	250-349	>350
No of occurrences	20	137	183	232	169	137	121	60	30	6

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UNIT-V

9. a) Explain in detail about the methods of separation of base flow. [7M]
    b) A peak of a flood hydrograph due to a six-hour storm is 470 m^3/sec. The average depth of rainfall is 8.0 cms. Assume an infiltration loss of 0.25 cm/hour and a constant base flow of 15 m^3/sec. Estimate the peak discharge of 6-hour unit hydrograph for this catchment, [7M]

(OR)

10. a) Describe the limitations and applications of unit hydrograph. [7M]
    b) Distinguish between hyetograph and hydrograph. [7M]

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SET - 3

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Answer any **FIVE** Questions **ONE** Question from **Each unit**
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UNIT-I

1. a) Discuss in brief the benefits and ill-effects of irrigation. [7M]
   b) What are the factors affecting duty? How can duty be improved? [7M]

(OR)

2. a) Explain the ill-effects and remedial measures of water logging. [7M]
   b) A field channel has culturable commanded area of 2000 hectares. The intensity of irrigation for gram 12 30% and for wheat is 50% gram has a kor period of 18 days and kor depth of 12cm, while wheat has kor period of 15 days and a kor depth of 15cm. calculate the discharge of the field channel. [7M]

UNIT-II

3. a) Enumerate the various types of linings used for canal. [7M]
   b) Design a Lacey's regime channel flowing through material of average diameter 0.328 mm, for the following data:
   Culturable commended area = 100000 hectares Intensity of Irrigation.
   Rabi =40%, Kharif = 30%
   Outlet discharge factor
   Rabi =1800 hec/cumec, Kharif = 800 hec/cumec [7M]

(OR)

4. a) Explain with help of a diagram the various components parts, along with their functions of a diversion headwork. [7M]
   b) A river discharges 1000 cum/sec of water at high flood level of RL 103 m. A weir is constructed for flow diversion with a crest length of 255m and total length of concrete floor as 40m. the weir has to sustain the under seepage at a maximum static head of 2.4m. the silt factor and the safe exit gradient for the river bed material are 1.1 and 1/6 respectively. Determine the depth of cutoff required at the downstream end of the concrete floor. Take the level of downstream concrete floor as R.L. 100m. check for exit gradient. [7M]

UNIT-III

5. a) Explain with the help of a diagram the hydrologic cycle? [7M]
   b) Describe the salient characteristics of precipitation on India. [7M]

(OR)

6. Explain the different method of determining the average rainfall over a catchment due to a storm. Discuss the relative merits and demerits of the various methods. [14M]

UNIT-IV

7. a) Describe (i) reference crop evapotranspiration and (ii) actual evapotranspiration. [7M]
   b) Discuss the factors that affect the evaporation from a water body. [7M]

(OR)

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8.   a)   Sketch the typical flow mass curve and explain how it could be used for the   [10M]
determination of (i) minimum storage needed to meet a constant demand (ii)
maximum constant maintainable demand from a given storage.

    b)   Discuss the runoff characteristics of streams   [4M]

UNIT-V

9.   a)   Discuss the principle of superposition   [4M]

    b)   The ordinates of a 4-hour unit hydrograph of catchment are given below: [10M]

Time (hours)	0	4	8	12	16	20	24	28	32	36	40	44
Ordinate 0f 4h UH (m^3/sec)	0	20	60	150	12	90	70	50	30	20	10	0

Derive the flood hydrograph in the catchment due to the storm given below:

Time from start of storm (h)	0	4	8	12
Accumulated rainfall (cm)	0	5.0	5.8	8.8

(OR)

10.   a)   Explain in detail about the components of hydrograph.   [7M]

    b)   Discuss in detail about synthetic unit hydrograph.   [7M]

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UNIT-I

1. a) Explain in detail about the classification of crops. [7M]
    b) After how many days will you supply water to soil (clay loam) in order to ensure efficient irrigation of the given crop, if. [7M]
        (i) Field capacity of soil =27%
        (ii) Permanent wilting point = 14%
        (iii)Dry density of soil = 15kN/m^3
        (iv)Effective depth of root zone =75 cm
        (v) Daily consumptive use of water for the given crop =11 mm.

(OR)

2. a) What do you understand by crop rotation? What are its advantages? [7M]
    b) Explain in detail about the consumptive use of water and factors affecting it. [7M]

UNIT-II

3. a) Discuss about the economics of canal lining? [7M]
    b) Compare Kennedy's and Lacey's silt theories. Why is Lacey's conception superior to that of Kennedy's. [7M]

(OR)

4. a) Distinguish between a weir and a barrage. [7M]
    b) Explain in detail the design of impervious floor for sub surface flow by Bligh's creep theory and their limitations. [7M]

UNIT-III

5. a) Describe briefly the sources of hydrological data in India. [7M]
    b) Explain a procedure for checking a rainfall data for consistency. [7M]

(OR)

6. Explain briefly the following relationships relating to the precipitation over a basin (a) depth area relationship (b) Max depth -area-duration curves. (c) Intensity -Duration-Frequency. [14M]

UNIT-IV

7. Explain in detail about the various abstractions from precipitation, [14M]

(OR)

8. a) Describe the use of flow mass curve to estimate the storage requirement of a reservoir to meet a specific demand pattern. What is the limitation of flow mass curve? [10M]
    b) Discuss the factors affecting runoff. [4M]

UNIT-V

9. a) What do you understand by unit hydrograph? How is it derived? Explain its use in construction of flood hydrograph resulting from two or more periods of rainfall. [10M]
    b) What are the characteristics of IUH [4M]

(OR)

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10.   The ordinates of a flood hydrograph, resulting from two successive storms each   [14M]
of 1 cm rainfall excess and 6 hour duration, are tabulated below. Find a 6 hour
unit hydragrpah.

Time (hours)	Ordinate of 6 hr flood hydrograph (m³/s)	Time (hours)	Ordinate of 6 hr flood hydrograph (m³/s)
0	10	42	126
6	30	48	92
12	90	54	62
18	220	60	40
24	280	66	20
30	220	72	10
36	166	--	--

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