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10CV55

Fifth Semester B.E. Degree Examination, Jan./Feb. 2021
Hydrology and Irrigation Engineering

Time: 3 hrs.

Max. Marks:100

Note: 1. Answer any FIVE full questions, selecting at least TWO full questions from each part.
 2. Assume missing data, if any suitably.

PART – A

- 1
 - a. Define precipitation. Explain different types of precipitation with sketches. (10 Marks)
 - b. Explain Thiessen and Isohyet methods of computing average rainfall. (05 Marks)
 - c. The normal annual rainfall of stations A, B, C and D in a catchment are 80.97, 67.59, 76.28, 92.01cm. In the year 2006, the station D was in operative when station A, B, C recorded annual rainfall of 91.11, 72.23, 79.89 cm. Estimate the missing rainfall at D in the year 2006 by normal ratio method. (05 Marks)

- 2
 - a. Define evaporation. Estimate evaporation by i) Meyer's ii) Rohwer's equations using given data:
 Reservoir area = 3km²
 Water temperature = 25°C and
 Saturated vapour pressure of water = 23.75mm of mercury
 Wind velocity at surface, V = 10km/hr
 Barometric reading = 750mm of mercury
 Relative humidity = 45%
 Find also volume of water evaporated per week. (10 Marks)
 - b. Explain factors affecting Evapo-transpiration. (05 Marks)
 - c. A seven-hour storm over a basin of 1830km² produced the rainfall intensities at half an hour interval are 4, 9, 20, 18, 13, 11, 12, 2, 8, 16, 17, 13, 6 and 1 mm/hr. The runoff volume is 73.2 × 10⁶m³. Estimate φ-index of the storm. (05 Marks)

- 3
 - a. Define hydrograph. Explain any three methods of base flow separation. (10 Marks)
 - b. The following are the ordinates of the flood hydrograph from a catchment area of 780km² due to 6 hr storm. Derive the 6hr unit hydrograph of the catchment assume a base flow of 40m³/s.

Time (hr)	6	12	18	24	6	12	18	24	6	12	18	24	6
Discharge (m ³ /s)	40	64	215	360	405	350	270	205	145	100	70	50	40

(05 Marks)

- c. A 4-hr unit hydrograph is given as:

Time (hr)	0	2	4	6	8	10	12	14	16	18	20
4-hr WHO	0	9	19	20	14	12	8	5	3	1	0

Derive 8-hr unit hydrograph.

(05 Marks)

- 4
 - a. Mention the factors affecting the flood. Explain briefly estimation of flood using envelope curves and empirical formulae. (10 Marks)
 - b. Explain relationship of out flow and storage. (05 Marks)
 - c. Briefly explain Muskingum routing method. (05 Marks)

PART – B

- 5 a. List different needs for Irrigation. Explain advantages and disadvantages of irrigation. (10 Marks)
- b. Explain with a neat sketch Furrow method of gravity irrigation system. (05 Marks)
- c. Explain different types of infiltration galleries. (05 Marks)
- 6 a. Define frequency of irrigation. Calculate frequency of irrigation in (days) to ensure sufficient irrigation of a certain crop using data:
 Field capacity of soil = 28%
 Permanent wilting point = 13%
 Density of soil = 1.3 gm/cc
 Effective depth of root zone = 70cm
 Daily consumptive use = 12mm
 Readily available moisture = 80% of available moisture. (ks)
- b. Explain functions of Irrigation soils. (ks)
- c. Explain soil-water-plant relationship using a neat sketch. (05 Marks)
- 7 a. List different types of Irrigation efficiencies. A stream of 130 litres/sec was delivered from a canal and 100 litres/sec were delivered to the field. An area of 1.6 hectares was irrigated in 8 hours. The effective depth of root zone was 1.7mt. The run off loss in the field was 420m^3 . The depth of water penetration vary linearly from 1.7m at head end of field to 1.1m at the tail end. Available moisture holding capacity of the soil is 20cm/mt depth of soil. Irrigation was started at a moisture level 50% of the available moisture. Determine:
 i) Water conveyance efficiency (10 Marks)
 ii) Water application efficiency
 iii) Water storage efficiency
 iv) Water distribution efficiency. (05 Marks)
- b. Define Duty, Delta and Base period and state the relationship between them. (05 Marks)
- c. Write brief note on crop seasons of India. (05 Marks)
- 8 a. Explain different types of canals. (10 Marks)
- b. Compare Kennedy's and Lacey's method of design of canal. (05 Marks)
- c. Design a channel for a discharge of $50\text{m}^3/\text{s}$ and silt factor 1.1, the side slope of channel is 1/2 H:1V. Also determine the bed slope of channel. (05 Marks)



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