

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.
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|-------------------------------|----|----|-----|-----|-----|-----|-----|-----|-----|-----|----|----|----|
| 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. (10 Marks)
- b. Explain functions of Irrigation soils. (05 Marks)
- 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 1.7m. 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/m depth of soil. Irrigation was started at a moisture level 50% of the available moisture. Determine:
 i) Water conveyance efficiency
 ii) Water application efficiency
 iii) Water storage efficiency
 iv) Water distribution efficiency. (10 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 Kenedy'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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