Register No.: .... Name: ....

SAINTGITS COLLEGE OF ENGINEERING (AUTONOMOUS)

(AFFILIATED TO APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY, THIRUVANANTHAPURAM)

FIFTH SEMESTER B.TECH DEGREE EXAMINATION (R,S), DECEMBER 2023
CIVIL ENGINEERING
(2020 SCHEME)

Course Code :   20CET307

Course Name: Hydrology and Water Resources Engineering

Max. Marks :   100   **Duration: 3 Hours**

PART A
(Answer all questions. Each question carries 3 marks)

1. Explain the concept of mass curve of rainfall and enlist its uses.
2. A rain gauge station X was inoperative for some time during which a storm had occurred. The storm readings at three surrounding stations A, B, C were 6.60, 4.80, 3.70 cm. respectively. The normal annual precipitation amounts at stations X, A, B, C are 65.5, 72.6, 51.8, 38.2 cm. respectively. Estimate the value of missing precipitation at station X.
3. Describe the Two-line method of separation of base flow.
4. Define a Unit hydrograph and enlist its uses.
5. Define the terms Duty and Delta.
6. Differentiate Gross command area and Culturable command area.
7. Explain the concept of meandering of rivers.
8. Explain the necessity of control of sedimentation in reservoirs.
9. Define and derive Darcy's law.
10. Sketch a Cavity type tube well and label its parts.

PART B
(Answer one full question from each module, each question carries 14marks)

MODULE I

11. a) Compute the mean rainfall over an area with the following data using Thiessen polygon method.

Station Name	Area of Polygon (km^2)	Precipitation (mm)
A	45	30.8
B	38	34.6
C	30	32.6
D	40	24.6

(5)

b) What are the different ways to control evaporation? Explain the measurement of evaporation using IMD pan.

(9)

OR

12. a) Explain the Isohyetal method for computation of mean precipitation over an area.   (5)

    b) A catchment has five rain gauges called A, B, C, D, E; in a year the annual rainfall recorded by the gauges are 82.6, 102.9, 180.3, 98.8, 136.7 cm respectively. For a 10% error in the estimation of mean rainfall, calculate the optimum number of rain gauges required.   (9)

MODULE II

13. a) Enumerate the factors affecting runoff.   (5)

    b) The rate of rainfall for successive 20 minute periods of a 140-minute storm are; 2.5, 2.5, 10, 7.5, 1.25, 1.25, 5 cm/hr respectively. Take φ-index = 3.2cm/hr and find out (a) Total rainfall in cm (b) Net runoff in cm (c) W-index.   (9)

OR

14. a) Enumerate the assumptions in the Unit hydrograph theory.   (5)

    b) Discharges observed at 6 hr intervals from an isolated storm of 3 hr duration for a catchment area of 320 km^2 are given. Assuming a constant base flow of 17 cumecs, derive and plot a 3 hr unit hydrograph.   (9)

Time (hr)	0	6	12	18	24	30	36	42	48
Discharge (cumecs)	17	120	270	200	150	85	55	30	17

MODULE III

15. a) Calculate the number of days to be lapsed before water needs to be supplied to the soil so as to ensure efficient irrigation if Field capacity of soil is 27%, Permanent wilting point is 14%, Dry density of soil is 15 kN/m^3, effective depth of root zone is 75 cm and daily consumptive use of water is 11 mm.   (6)

    b) Explain the factors affecting duty and methods to improve duty.   (8)

OR

16. a) Define various Irrigation efficiencies.   (6)

    b) Explain the different types of irrigation.   (8)

MODULE IV

17. a) Explain the types of reservoirs.   (6)

    b) Explain the determination of reservoir capacity using Mass curve method.   (8)

OR

18. a) List out the factors to be considered while selecting a site for a stream gauging station.   (6)

    b) Enumerate the types of river training works and explain any two   (8)

types with the help of figures.

MODULE V

19.   a)   Explain the zones of underground water.   (6)

     b)   A tube well fully penetrates a confined aquifer of thickness 30 m and coefficient of permeability 38 m/day. Determine the radius of well if the yield required is 40 litres/s under a drawdown of 4 m. Use radius of influence as recommended by Sichardt.   (8)

OR

20.   a)   Explain recuperation test for determining yield of open wells.   (6)

     b)   A well penetrates a confined aquifer 10 m thick having a coefficient of permeability of 0.004 m/s. The well radius is 100 mm and is to be worked under a drawdown of 4 m at the well face. Calculate the discharge from the well. What will be the percentage increase in discharge if the radius of the well is doubled? Take R = 300 m in each case.   (8)

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