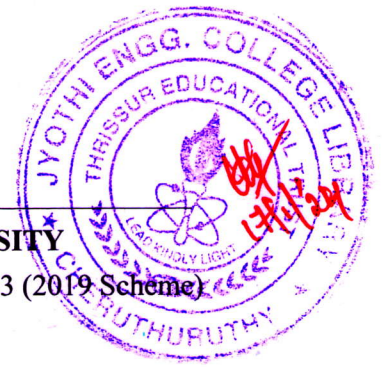Reg No.:_____   Name:_____

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APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

B.Tech Degree S5 (R, S) / S3 (PT) (R, S) Examination December 2023 (2019 Scheme)

Course Code: CET 307

Course Name: HYDROLOGY & WATER RESOURCES ENGINEERING

Max. Marks: 100   Duration: 3 Hours

PART A
(Answer all questions; each question carries 3 marks)   Marks

|		
1	Differentiate between mass rainfall curve and hyetograph.	3
2	Explain Horton's model of infiltration.	3
3	List out any three assumptions made in the derivation of unit hydrograph.	3
4	Explain the various empirical methods for the estimation of design flood.	3
5	Define (i) Duty (ii) Delta and (iii) Base Period	3
6	The field capacity of a certain soil is 15% and the moisture content of the soil before irrigation is 8%. Determine the depth up to which the soil profile will be wetted with an application of 60 mm of water. Take dry unit weight of soil as 15 KN/m³.	3
7	What is trap efficiency? What is its significance?	3
8	Discuss the steps involved in the construction of a flow duration curve.	3
9	Write notes on any three geological formations.	3
10	Define perched aquifer.	3

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

Module -1

11 a) A precipitation station X was inoperative for some time during a storm. At three stations A, B and C surrounding X, the total precipitation recorded during this storm are 75, 58 and 47 mm respectively. The normal annual precipitation amounts at X, A, B and C are 757, 826, 618 and 482 respectively. Estimate the storm precipitation for station X.   4

b) Explain the measurement of evaporation using evaporation pans. What are the various methods by which evaporation losses can be controlled?   10

12   The figure below represents a catchment area with the precipitations observed in a
      year. Calculate the mean precipitation by the Thiessen polygon method and check the
      result roughly by the arithmetic mean method.

                                                                                        14
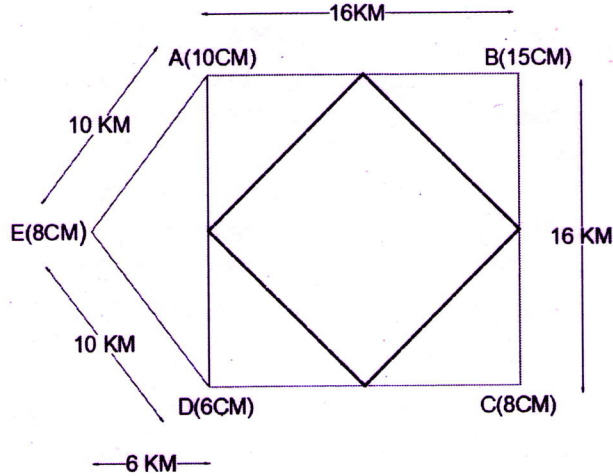
Module -2

13 a) The ordinates of a 4-hr unit hydrograph for a catchment are given. Derive 12- hr unit
        hydrograph for the same catchment.

Time (h)	0	4	8	12	16	20	24	28	32	36	40	44
4 h- UH (m³/s)	0	24	76	125	148	136	92	57	29	17	6	0

                                                                                        8

   b) Define the following: i) SPF ii) PMF iii) Recurrence interval   6

14 a) Explain the components of a hydrograph with neat sketch. How will you separate base   9
        flow from a hydrograph?

   b) The rates of rainfall for the successive 30 min period of a 3-hour storm are 17, 35,   5
        51,27,23 and 9 mm/hr. The corresponding surface runoff is estimated to be 36 mm.
        Establish the infiltration indices.

Module -3

15 · a) What are the factors affecting duty of water of a canal system?   6

b) The base period, duty and intensity of irrigation for various crops under the canal system are given below. Determine the reservoir capacity if culturable commanded area is 4000 hectares, canal losses are 25 % and reservoir losses are 15 %.

Crop	Base period (days)	Duty (hectares/cumec)	Intensity of irrigation
Wheat	120	1800	20%
Sugar cane	360	1700	20%
Cotton	180	1400	10%
Rice	120	800	15%
Vegetables	120	700	15%

8

16 a) Explain in detail the various types of irrigation efficiencies.   9

b) Compare and contrast: a) Permanent wilting point and temporary wilting point   5

    b) Saturation capacity and Field capacity

Module -4

17 a) A reservoir has a capacity of 3.6 M ha-m up to the level of the spillway crest. The average annual inflow is 1.5 M ha-m of water. If the average annual sediment inflow is 3×10^{11} kg, determine the useful life of the reservoir assuming that the usefulness of the reservoir is terminated when 2/3 of the total capacity is filled with sediments. Assume density of sediment as $1250kg/m^3$ 10

Capacity/Inflow Ratio	2.4	2	1.6	1.2	0.8	0.4
Trap Efficiency %	98.2	98	97.5	97	96	95

b) What is stage discharge curve?   4

18 a) Explain the procedure for determining the capacity of a reservoir of given yield by mass inflow curve.   7

b) Discuss in detail about the various types of river training works.   7

Module -5

19 a) Obtain an expression for discharge for a steady radial flow from a well fully penetrating an unconfined aquifer.   9

b) Compare open well with tube wells.   5

20 a) During a recuperation test conducted on an open well in a region, water level in the   9
well was depressed by 3m and it was observed to rise by 1.75 m in 75 minutes.
What is the specific yield of open well in that region. What will be the yield from a
well of 5m diameter under a depression head of 2.5m. What should be the diameter
of the well to give a yield of 12 litres /sec under a depression head of 2m.

b) What is well loss? How it is related to specific capacity of a well?   5

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