Please check that this question paper contains__9__ questions and __3__ printed pages within first ten minutes.

[Total No. of Questions: 09] [Total No. of Pages: ...3..]

EVENING

19 JUN 2023

Uni. Roll No. .....

Program: B.Tech. (Batch 2018 onward)
Semester: 4th
Name of Subject: Hydrology and Water Resources Engineering
Subject Code: PCCE-107
Paper ID: 16178
Scientific calculator is allowed

Time Allowed: 03 Hours **Max. Marks: 60**

NOTE:

1) Parts A and B are compulsory
2) Part-C has Two Questions Q8 and Q9. Both are compulsory, but with internal choice
3) Any missing data may be assumed appropriately

Part – A **[Marks: 02 each]**

Q1.

a) Write a short note on 'Orographic Precipitation'.
b) Define 'Duty' and 'Delta' and derive their relationship.
c) Write two basic assumptions that constitute the basis of unit hydrograph theory.
d) Enlist the advantages of lining.
e) Find the delta for a crop when its duty is 912 hectares/cumec on the field, the base period of this crop is 145 days.
f) The isohyets for annual rainfall over a catchment basis were drawn. The area of strips between the isohyets is indicated below in table. Find the average depth of annual precipitation over the basin.

Isohyets (cm)	Area in sq. km.	Isohyets (cm)	Area in sq. km.
60-70	680	90-100	1460
70-80	1530	100-120	750
80-90	2860	120-150	180

P.T.O.

Part – B **[Marks: 04 each]**

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Q2. What is meant by-
a. Depth-Area-Duration Relationship
b. Intensity-Duration-Frequency Relationship

Q3. Discuss in detail about 'Hydrologic Cycle'. Draw a neat sketch of the same.

Q4. Briefly explain any two causes of failure of earthen dams.

Q5. A reservoir with a surface area of 500 hectares has the following average meteorological values during a given week.
Water temperature - 40°C
Relative humidity – 50%
Wind velocity at 1m above ground – 10 km/h
Mean barometer reading – 750 mm of Hg
Estimate the average daily evaporation from the lake reservoir, and the volume of water evaporated from the lake during this week. Compare the results obtained by Meyer's formula and Rohwer's formula.

Q6. Five rain gauge stations were installed in the catchment of a river. The average annual rainfall values at these stations are 780, 590, 460, 550 and 600 mm respectively. Determine the optimum number of rain gauges in the catchment seeking the error to be limited to 10%. Also, determine the number of extra gauges (if any) required to be installed.

Q7. For a storm of 140 minutes, rates of rainfall for successive 20 minutes are presented below-

3.0, 2.75, 10.0, 8.5, 1.25, 1.45, 6 (cm/hr)

Taking the values of ϕ_{index} as 3.5 cm/hr, find out the total rainfall, net runoff and the value of W_{index}.

Part – C **[Marks: 12 each]**

Q8. Enlist and elaborate the different types of recording type rain gauges with neat sketches.

OR

(a) What are the requirements of good lining of canals? (4)

P.T.O.

(b) Write in detail about- (8)

1. Cement Concrete Tile Lining
2. Boulder Lining

Q9. Given the ordinates of a 4-h unit hydrograph as below. Derive the ordinates of a 12-h unit hydrograph for the same catchment.

Time(h)	Ordinate of 4-h UH
0	0
4	20
8	80
12	130
16	150
20	130
24	90
28	52
32	27
36	15
40	5
44	0

OR

Design an irrigation channel using to carry 50 cumecs of discharge with B/D, i.e. base width to depth ratio as 2. The critical velocity ratio is 1.0. Take Kutter's rugosity coefficient as 0.023. Use Kennedy's method.

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