

Please check that this question paper contains 9 questions and 2 printed pages within first ten minutes.

EVENING

[Total No. of Questions:09]

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Uni. Roll No.

14 JAN 2023

Program: **B. Tech**

Semester: 4TH

Name of Subject: **Hydrology and Water Resource Engineering.**

Subject Code: **PCCE-107**

Paper ID: **16178**

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) What are the components of Hydrological cycle?
 - b) Why there is a need to provide lining in the canals?
 - c) Precipitation station D was inoperative for a part of a month during which a storm occurred. The storm rainfall recorded at three surrounding stations A,B, and C were 8.5, 6.7, and 9.0 cm respectively. The average annual rainfall of station D, A,B and C are respectively, 90, 75, 84 and 70 cm. Estimate the Storm precipitation for station D.
 - d) What are the causes of waterlogging?
 - e) Name the forces acting on gravity dams.
 - f) Define crop period and Base period.

Part – B

[Marks: 04 each]

- Q2.** Describe briefly different methods to calculate the mean depth of precipitation on a basin and discuss the relative suitability and unsuitability of each method?
- Q3.** Discuss in detail the factors influencing Infiltration ?
- Q4.** For a river, the estimated flood peaks for two return periods by the use of Gumbel's method are as follows:

Return period(Years)	Peak flood (cumecs)
100	485
50	445

What flood discharge in this river will have a return period of 1000 years?

- Q5.** Massive head type of buttress dams are considered to be best of all the available types of buttress dams. Why?
- Q6.** Briefly compare lacey's and Kennedy's theory.
- Q7.** What is relation between duty and delta. If wheat requires about 7.5 cm of water after every 28 days, and the base period for wheat is 140 days, find out the value of delta for wheat.

Q8. The ordinates of a 4-h unit hydrograph are as given below:

Time	6-h UH ord.(m ³ /s)	Time	6-h UH ord.(m ³ /s)
0	0	24	70
4	20	28	50
8	60	32	30
12	150	36	20
16	120	40	10
20	90	44	0

Derive the flood hydrograph due to the storm given below.

Time from beginning of storm(h)	0	4	12	18
Accumulated rainfall(cm)	0	5.0	5.8	8.8

The Φ -index for the catchment is 0.25 cm/h and the base flow at the time of storm was 20m³/s.

OR

A 4-h unit hydrograph for a basin has the following ordinates. Using the S-curve method, determine the 12-h unit hydrograph ordinates.

Time (h)	0	4	8	12	16	20	24	28	32	36	40	44
Discharge(m ³ /s)	0	20	80	130	150	130	90	52	27	15	5	0

Q9. An earth dam made of homogeneous material has the following data:

Coefficient of permeability of dam material = 5×10^{-4} cm/sec.

Level of top of dam = 200.00 m

Level of deepest river dam = 178.00 m

H.F.L. of reservoir = 197.50 m

Width of top of dam = 4.5 m

Upstream slope = 3:1

Downstream slope = 2:1

Determine the phreatic line for this dam section and the discharge passing through the dam

OR

Q10. Prove that for minimum concrete in arch dams the central angle should be $133^{\circ}-34'$.
