

EVENING

[Total No. of Questions: 09] [Total No. of Pages: 03]
 Uni. Roll No. _____
27 JUN 2022
 Program: B.Tech. (Batch 2018 onward)
 Semester: 4th
 Name of Subject: Hydrology and Water Resources 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) Explain Hydrological cycle with a neat sketch.
 b) Write down the steps to determine optimum number of rain gauges required to be installed in a catchment.
 c) What are the causes of water logging?
 d) Why there is a need to provide lining in the canals?
 e) How will you separate Base flow from hydrograph of a river?
 f) Determine the dimensions of elementary profile of a low gravity dam.

Part - B [Marks: 04 each]

- Q2. Discuss in detail the factors influencing evaporation?
 Q3. For a catchment area of 8.6 sq. Km, the following mass curve of rainfall of 4 hr storm is given below. Determine the effective rainfall hyetograph and the volume of direct runoff from the catchment due to the above storm, taking ϕ - index of the catchment as 0.8 cm/hr.

Time from start of storm (h)	0	0.5	1	1.5	2	2.5	3	3.5	4
Accumulated rainfall (cm)	0	4	1.1	2.3	3.8	4.8	5.6	6.2	6.7

- Q4. Explain different techniques of water distribution in farms. Also discuss advantages and disadvantages of different techniques.

EVENING

27 JUN 2022

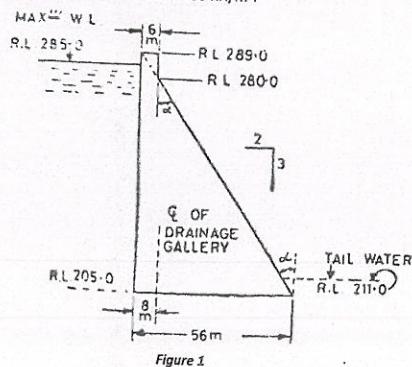
- Q5. Define duty and delta; also derive the relation between them. Find delta for a crop when its duty is 934 hectares per cumec on field. The base period of this crop is 128 days.
 Q6. Discuss in detail Kennedy's silt theory
 Q7. For a river, the estimated flood peaks for two return periods by the use of Gumbel's method are as follows:

Return period(Years)	Peak flood (cumecs)
50	40,809
100	46,300

What flood discharge in this river will have a return period of 500 years?

Part - C [Marks: 12 each]

- Q8. Figure - 1 shows the section of gravity dam built of concrete. Calculate
 a) Maximum vertical stresses at the heel and toe of the dam.
 b) The major principle stress at toe of the dam.
 c) The intensity of shear stress on a horizontal plane near the toe.
 Take wt. of concrete = 2.4 t/m³ Neglect earthquake effects.
 Take allowable stress in concrete as 2500 KN/m².



OR

An earth dam made of homogeneous material has the following data:
 Coefficient of permeability of dam material = 8×10^{-3} cm/sec.
 Level of top of dam = 194.00 m
 Level of deepest river dam = 180.00 m
 H.F.L. of reservoir = 192.00 m
 Width of top of dam = 4.0 m

Upstream slope = 2.5:1
 Downstream slope = 2:1

Calculate the seepage per m length through the body of the dam.

EVENING
 27 JUN 2022

Q9. The ordinates of a 6-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	36	66
6	20	42	50
12	60	48	32
18	150	54	20
24	120	60	10
30	90	66	0

Derive the flood hydrograph due to the storm given below.

Time from beginning of storm(h)	0	6	12	18
Accumulated rainfall(cm)	0	4	5	10

The ϕ index for the storm can be assumed to be 0.167 cm/h. Assume base flow to be 20m³/s constant throughout.

OR

Given a 2 hr. Unit hydrograph, find the 3 hr. unit hydrograph from the catchment.

Time	2-hr UH (cumecs)	Time	2-hr UH (cumecs)	Time	2-hr UH (cumecs)
0	0	8	120	16	32
1	10	9	105	17	26
2	20	10	90	18	20
3	40	11	80	19	15
4	60	12	70	20	10
5	105	13	60	21	5
6	150	14	50	22	0
7	135	15	41		

EVENING
 27 JUN 2022