

Ref No. –Ex/CE/5/T/204/2025

BE(CE) 2nd YEAR EXAMINATION, 2025
(2nd Semester)
SUBJECT: Hydrology

Time: Three hours

Full Marks 100
(50 marks for each part)

Use a separate Answer-Script for each part

No. of Questions	Part I	Marks
	Answer question no.1 (compulsory) and any three from the rest. Assume relevant data if necessary.	
Q1. a)	Fill in the blanks:	1×10
i.	The maximum rainfall which is physically possible for a catchment area for a particular duration is known as _____	
ii.	Lysimeter is used to measure _____	
iii.	Evaporation is confined in _____	
iv.	The chemical that is most suitable for controlling evaporation from a water body is _____	
v.	The most accurate method for determining average precipitation is _____	
vi.	For streamflow measurement using one point method the current meter is installed at a depth _____ below surface.	
vii.	The maximum rate at which a given soil at a given time can absorb water is defined as _____	
viii.	The dissolved salt in water _____ the rate of evaporation.	
ix.	The precipitation above which all the precipitation contribute surface runoff is known as _____	
x.	In DAD curves maximum average depth may be _____ with duration for a given area.	
b)	Write short note on (Any two)	5 ×2=10
i.	Horton's Infiltration model	
ii.	Energy budget equation to determine evaporation for a water body	
iii.	Interception loss	
Q 2.	Writing characteristic feature distinguish between	2.5×4=10
	a. Field capacity and infiltration capacity	
	b. El nino and La nina	
	c. Warm front and cold front	
	d. Isopleth and isopluvial line	

[Turn over

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No. of Questions	Part I	Marks																						
Q 3.a)	In between class A land pan and US Geological floating pan which one give accurate result of evaporation for a particular area and why?	2																						
b)	What are the effects of water temperature and vegetation on infiltration rate?	2																						
c)	On the basis of rainfall data the 25 year-24 hr maximum rainfall at Kolkata is found 170 mm. Determine the probability of 24 hour rainfall of magnitude 170 mm occurring at Kolkata:	1+2 +1+2																						
	I) Twice in fifteen successive years																							
	II) Not occurring in fifteen successive years																							
	III) At least once in fifteen successive years																							
Q 4.	The mass curve of an isolated storm in a 500 ha watershed is as follows:																							
	<table border="1"> <tr> <td>Time since start (min)</td> <td>0</td> <td>2</td> <td>4</td> <td>6</td> <td>8</td> <td>10</td> <td>12</td> <td>14</td> <td>16</td> <td>18</td> </tr> <tr> <td>Cumulative rainfall (mm)</td> <td>0</td> <td>8</td> <td>26</td> <td>28</td> <td>41</td> <td>73</td> <td>108</td> <td>118</td> <td>124</td> <td>126</td> </tr> </table>	Time since start (min)	0	2	4	6	8	10	12	14	16	18	Cumulative rainfall (mm)	0	8	26	28	41	73	108	118	124	126	10
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Cumulative rainfall (mm)	0	8	26	28	41	73	108	118	124	126														
	If the direct runoff produced by the storm is measured at the outlet of the watershed as 0.34 Mm^3 , estimate the Φ -index of the storm and duration of the excess rainfall. Also plot the hyetograph to show the Φ -index.																							
Q5.(a)	Write the basic assumptions of slope area method of streamflow measurement.																							
(b)	A 25g/L solution of a tracer was discharged into a stream of constant rate of $10\text{cm}^3/\text{s}$. The background concentration of the tracer in the stream water was found to be zero. At a drawdown section sufficiently far away, the tracer was found to reach an equilibrium concentration of 5ppb . Writing relevant equation determine the stream discharge.	2 3+1																						
(c)	With a neat sketch establish the formula to calculate streamflow discharge by ultrasonic method.	4																						

BACHELOR OF ENGINEERING (CIVIL ENGINEERING)
SECOND YEAR
SECOND SEMESTER EXAM 2025
Hydrology
Part II (50 Marks)

Use separate answer script for each part

Answer any two questions

1. a) State the differences between overland flow and interflow.
b) Discuss with necessary sketches the influence of catchment characteristics on run-off.
c) The observed mean monthly flows of a stream for one year period from June to May in m^3/s are 18, 20, 46, 42, 37, 30, 33, 23, 26, 21, 19 and 8.

Determine the flow which can be expected 80 percent of time. 10 + 6 + 9 = 25

2. a) Distinguish with necessary sketches between confined and unconfined aquifer.
b) Derive with necessary sketches an expression for the steady state discharge of well fully penetrating a confined aquifer.
c) A well of 0.5 m diameter penetrates fully into a confined aquifer of thickness 20 m and hydraulic conductivity $8.2 \times 10^{-4} \text{ m/s}$. What is the maximum yield from this well if the drawdown in the well is not to exceed 3m. The radius of influence may be taken as 260 m.

6 + 10 + 9 = 25

3. a) Define unit hydrograph. What are the assumptions underlying the unit hydrograph theory ?

- b) What is a S curve hydrograph ? How it is constructed ? What are its uses ?

The ordinates of a 4h unit hydrograph of a basin measured at 1h intervals are 6, 36, 66, 91, 106, 93, 79, 68, 58, 49, 41, 34, 27, 23, 17, 13, 9, 6, 3 and $1.5 \text{ m}^3/\text{s}$ respectively.

Obtain the ordinates of a 3 h unit hydrograph for the basin using S curve technique.

6 + 9 + 10 = 25