

Time: Three hours

Use a separate Answer-Script for each part

No. of Questions	Part I (60 Marks)	Marks																				
Answer all the questions. Answer should be brief and to the point. All the notations have their usual meaning. Assume relevant data if not provided. All the relevant drawings should be in pencil.																						
Part-A (Related to CO2)																						
Q1. a)	List two human interferences on hydrological cycle. Arrange the three methods of determining mean precipitation for an area in chronological order in terms of their accuracy.	2+3																				
b)	Determine the total evaporation from a lake surface of area 100 km ² by the water budget method during summer (May-August) of 2024 if the water level was +571.04m on 1 st May and +571.1m on 31 st August. During this period 100 mm precipitation was recorded. The lake received average inflows of 15, 20 and 17 m ³ /s from three rivers and outflow of 45 m ³ /s during that period. Assume that there is no contribution to and from the ground water storage.	5																				
Q 2.a)	Write the effects of species composition and storm characteristics on interception process. Writing characteristic features differentiate between: PET and PMP; Evaporation and evapotranspiration process	2+3×2																				
b)	Results of an infiltrometer test on a soil are as follows: Establish the Horton's equation graphically.	7																				
<table><tr><td>Time since start (min)</td><td>5</td><td>10</td><td>15</td><td>20</td><td>30</td><td>40</td><td>60</td><td>80</td><td>100</td></tr><tr><td>Cumulative infiltration (mm)</td><td>21.5</td><td>37.7</td><td>52.2</td><td>65.8</td><td>78.4</td><td>89.5</td><td>101.8</td><td>112.6</td><td>123.3</td></tr></table>			Time since start (min)	5	10	15	20	30	40	60	80	100	Cumulative infiltration (mm)	21.5	37.7	52.2	65.8	78.4	89.5	101.8	112.6	123.3
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Q 3.a)	Plot (i) Maximum intensity-return period-duration; (ii) Maximum intensity-duration-return period curve and (iii) Maximum depth-duration-return period curve	1×3																				
b)	Write true and false with proper justification. No marks will be credited if justification will not be written.	1.5×2																				
(i) Pan coefficient should be multiplied with the evaporimeter result to get the actual evaporation for an area.																						
(ii) ϕ-index is more accurate than W-index.																						
c)	Fill in the blanks	1×4																				
(i) El Nino is associated with abnormally _____ waters accumulate in tropical latitudes of the central and eastern Pacific Ocean with a weakening of the low-level easterly winds.																						
(ii) Depth of rainfall _____ with increasing area for a given time.																						
(iii) Double mass curve is used to check _____.																						
(iv) The line joining points of equal rainfall depth is known as _____.																						
d)	Match the columns:	1×5																				
<table><tr><td>Column-A</td><td>Column-B</td></tr><tr><td>Penman's Formula</td><td>Evaporation</td></tr><tr><td>Rohwer's Formula</td><td>Infiltration</td></tr><tr><td>Green-Ampt's Formula</td><td>Evapotranspiration</td></tr><tr><td>Tipping bucket method</td><td></td></tr><tr><td>Colorado sunken pan</td><td>Precipitation</td></tr></table>			Column-A	Column-B	Penman's Formula	Evaporation	Rohwer's Formula	Infiltration	Green-Ampt's Formula	Evapotranspiration	Tipping bucket method		Colorado sunken pan	Precipitation								
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Ref No. –Ex/CE/PC/B/T/222 /2025

B.E.C.E. 2nd YEAR EXAMINATION, 2025
(2nd Semester)
SUBJECT: Water Resource Engg.-I

Full Marks 100

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No. of Questions	Part I (60 Marks)	Marks
	Section-B (Related to CO-3)	
Q4.a)	Write the names and dimensions of the formation constants for confined aquifer.	2×2
b)	Write true or false with proper justification. <u>No marks will be credited if justification will not be written:</u>	1.5×4
	i. Perched aquifer is a common phenomenon for confined aquifer. ii. Intrinsic permeability is the function of both the soil particles and fluid properties. iii. Actual velocity through soil and discharge velocity are not same. iv. An increase in the atmospheric pressure causes increase in water table in the well.	
c)	With a neat sketch, deducing the expression for a 30 cm dia well completely penetrating in unconfined aquifer of depth 25m at a steady state condition determine the transmissibility of the aquifer when the rate of withdrawal from the well is 2100 lpm and drawdown in observation wells at radial distances 30m and 90m from the well are 5m and 4m respectively.	2+5+3

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No. of Questions	Part II (40 Marks)	Marks
	Answer any two questions.	4
Q1. a)	State the differences between overland flow and interflow.	4
b)	Discuss the influence of catchment characteristics on run-off.	8
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.	8
Q 2.a)	What is the stage of a river? Discuss functioning of float gauge recorder with necessary sketches for stage measurement.	2+10
b)	In a stream with no trace of salt initially a salt solution with a concentration of 20 mg/cc is introduced at a constant rate of 2 litres per minute. The samples collected at a downstream section sufficiently far away indicated an equilibrium salt concentration of 0.05 ppm. Determine the discharge in the stream.	8
Q 3.a)	Sketch a typical hydrograph resulting from an isolated storm and identify the features of the same.	8
b)	The ordinates of a 6h unit hydrograph of a catchment is given as : Time (h) 0 3 6 9 12 15 18 24 30 36 42 48 54 60 Ordinate 0 25 50 85 125 160 185 160 110 60 36 25 16 8 Derive the flood hydrograph in the catchment due to the storm given below : Time from start of storm (h) 0 6 12 18 Accumulated rainfall (cm) 0 3.6 11.0 16.5 The storm loss rate for the catchment is estimated as 0.25 cm / h. The base flow is assumed as 15 m³/s at the beginning and increased by 2 m³/s for every 12 hrs till the end of the direct run-off hydrograph.	12