Ref. No. Ex/CE/PE/B/T/415C/2024

BACHELOR OF ENGINEERING IN CIVIL ENGINEERING EXAMINATION 2024

(Fourth Year, First Semester)

Water Resources Engineering IE

[WRE IE]

Time: Three Hours | Full Marks 100

Use a separate Answer-Script for each part. Each part carries equal marks

Q No		Part I (50 Marks)		Marks
		*Attempt **all Questions** in this Part* *Assume suitable values for the parameters if not supplied*		
1	(a)	Define and explain the utility of rating curve.	CO3	5
	(b)	Draw a rating curve, on an appropriate graph sheet, for the discharge 82.35 m^3/s, assuming initial gauge reading as 3.5m, and the increment of water level is 0.2m/hr for 24 hours.	CO3	5
2	(a)	Define general rating curve. Draw and explain a typical rating curve. What is the utility of the rating curve?	CO3	1+2+3= 6
	(b)	What is the probability that the standard normal random variable z will be less than -1 and less than 1? What is P(-1< z <1)? The coefficients of *Abramowitz and Stegun's* (1965) polynomial are as follows: First order coefficient = 0.196854; Second order coefficient = 0.115194 Third order coefficient = 0.000344; Fourth order coefficient = 0.019527	CO4	3
	(c)	Write short note on 'Probability Distribution Function' and 'Probability Density Function'.	CO3	3
	(d)	Define: (i) Relative frequency, (ii) Objective and subjective probabilities, (iii) Conditional probability, (iv) Cumulative probability	CO3	8
3	(a)		CO4	15

Gauge Distance from Initial Point at Bank of the Stream (M)	Depth, d (m)	Mean Velocity v (m/s)	Gauge Distance from Initial Point at Bank of the Stream (M)	Depth, d (m)	Mean Velocity v (m/s)
0	0.0	0.00	180	5.7	2.25
10	3.1	0.37	190	5.1	2.05
30	4.4	0.87	210	6.0	1.44
50	4.6	1.09	225	6.5	1.32
70	5.7	1.34	240	7.0	1.20
90	4.5	1.36	255	7.2	1.04
110	4.4	1.39	270	6.2	0.86
130	5.4	1.42	285	5.5	0.45
150	6.1	2.03	300	3.6	0.26
160	5.8	2.22	315	0.0	0.00

		Estimate the discharge of a particular location of a stream for the data tabulated below.		
	(b)	Draw a rating curve, on an appropriate graph sheet, for the total discharge estimated above; assuming initial gauge reading as 4.0m, and the increment of water level is 0.2m/hr for 12 hours.	CO3	5

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B.E.C.E. 4th YEAR EXAMINATION, 2024

1ST SEMESTER

SUBJECT: WATER RESOURCES ENGINEERING IE

TIME: THREE HOURS FULL MARKS:100

USE A SEPARATE ANSWER-SCRIPT FOR EACH PART

No. of Questions	Part-II (Full Marks 50)	Marks
	Answer all the questions. Answer should be brief and to the point. Use pencil for any sketch. Assume any relevant data if not provided. Abbreviations have their usual meanings.	
	Section-A (CO-1)	
Q1.	With neat labelled sketch establish the one-dimensional equation of groundwater table of an unconfined aquifer allowing flow of water between two parallel water bodies of head Y_1 and Y_2 of L distance apart with recharge from top. What is the shape of the water table for this case? What will be the shape of the water table for the same aquifer without any recharge from the top? If the water bodies are 4 km apart of head 12m and 9m respectively over the impervious bed, the permeability of aquifer is 1.5m/day and rate of recharge is $2m^3/yr$ per m^2 area then find the location and elevation of the water divide for the unconfined aquifer. Write Dupuit's assumption for unconfined aquifer.	2+5+ 1+1 +4+2
Q2. (a)	Discuss the process of advection and hydrodynamic dispersion responsible for groundwater pollutant transfer.	2 × 2
(b)	Suppose $1m^3$ of aquifer is contaminated with 40L 1,2 DCE. The aquifer has porosity of 0.4. Groundwater moves through it with an actual speed of 0.04m/day. The 1.2 DCE has a dissolved concentration equal to 15% of its aqueous solubility. The actual velocity of flow of ground water is 0.5m/d. Assume aqueous solubility of 1.2 DCE is 0.87g/100ml and specific gravity 1.253 g/cc. Determine the time required to clean the pollutant from the aquifer through advection process only.	4
(c)	With neat labelled sketch justify "for every m of rise of fresh water in an unconfined aquifer above sea level there will be 40m of fresh water in the aquifer below sea level".	5
(d)	Write two mechanisms of control for salt water intrusion in aquifer.	2
	Section-B (CO2)	
Q3. (a)	Explain in detail: (i) Well loss, (ii) Specific capacity of well and (iii) well efficiency	2×3
(b)	With a neat sketch of pattern of drawdown determine the drawdown in a 50cm diameter well pumping at a rate of 2000lpm located at a distance 120m from a recharging canal creating unsteady state of condition in and surround the well. The transmissivity of the aquifer is $0.015m^2/s$.	5
Q4.	Determine graphically the aquifer parameters of a confined aquifer if the drawdown time data recorded at an observation well situated at a distance of 50m from the pumping well of 30cm dia having rate of discharge of 1800 lpm are:	9

Time (min)	1.5	3	4.5	6	10	20	40	100
Drawdown (m)	0.15	0.6	1.0	1.4	2.4	3.7	5.1	6.9