

BACHELOR OF ENGINEERING IN CIVIL ENGINEERING EXAMINATION 2024

(Fourth Year, First Semester, Supplementary)

**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																																																																		
<i>Attempt all Questions in this Part Assume suitable values for the parameters if not supplied</i>																																																																					
1	Define and explain the utility of rating curve. Draw a rating curve, on an appropriate graph sheet, for the discharge $85 \text{ m}^3/\text{s}$, assuming initial gauge reading as 4.0m, and the increment of water level is 0.2m/hr for 24 hours	CO3	5+5=10																																																																		
2	Explain the stream flow measurement method, with suitable diagram.	CO3	10																																																																		
3	Write short note on 'Probability Distribution Function' and 'Probability Density Function'. Also define: (i) Relative frequency, (ii) Objective and subjective probabilities, (iii) Conditional probability, (iv) Cumulative probability	CO3	2+8=10																																																																		
4	Estimate the discharge of a particular location of a stream for the data tabulated below.	CO4	10																																																																		
<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>Gauge Distance from Initial Point at Bank of the Stream (M)</th> <th>Depth, d (m)</th> <th>Mean Velocity v (m/s)</th> <th>Gauge Distance from Initial Point at Bank of the Stream (M)</th> <th>Depth, d (m)</th> <th>Mean Velocity v (m/s)</th> </tr> </thead> <tbody> <tr><td>0</td><td>0.0</td><td>0.00</td><td>180</td><td>5.7</td><td>2.25</td></tr> <tr><td>10</td><td>3.1</td><td>0.37</td><td>190</td><td>5.1</td><td>2.05</td></tr> <tr><td>30</td><td>4.4</td><td>0.87</td><td>210</td><td>6.0</td><td>1.44</td></tr> <tr><td>50</td><td>4.6</td><td>1.09</td><td>225</td><td>6.5</td><td>1.32</td></tr> <tr><td>70</td><td>5.7</td><td>1.34</td><td>240</td><td>7.0</td><td>1.20</td></tr> <tr><td>90</td><td>4.5</td><td>1.36</td><td>255</td><td>7.2</td><td>1.04</td></tr> <tr><td>110</td><td>4.4</td><td>1.39</td><td>270</td><td>6.2</td><td>0.86</td></tr> <tr><td>130</td><td>5.4</td><td>1.42</td><td>285</td><td>5.5</td><td>0.45</td></tr> <tr><td>150</td><td>6.1</td><td>2.03</td><td>300</td><td>3.6</td><td>0.26</td></tr> <tr><td>160</td><td>5.8</td><td>2.22</td><td>315</td><td>0.0</td><td>0.00</td></tr> </tbody> </table>				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
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5	The values of annual precipitation in a particular area from 1960 to 2009 has been given in the following table. Use this data to plot the time series curve and the frequency histogram. Also estimate the probability of the annual precipitation in any year to be occurred less than 30mm; greater than 40mm and in between them.	CO4	10																																																																		
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No. of Questions	Part-II (Full Marks 50)	Marks
	<p>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.</p> <p>Section-A (CO-1)</p> <p>Q1. With neat labelled sketch establish the one-dimensional equation of steady groundwater flow through confined aquifer allowing flow of water between two parallel water bodies of head Y_1 and Y_2 of L distance apart. What will be the shape of the water table for an unconfined aquifer with and without recharge from the top? If the water bodies are 4 km apart of head 12m (Y_1) and 9m (Y_2) respectively over the impervious bed, the permeability of the confined aquifer is 10m/day and height 5m over the impervious bed and permeability of unconfined aquifer is 25m/day over the confined aquifer then find the water seepage from river Y_1 to Y_2 per unit length of flow assuming there is no recharge from top.</p> <p>Q2. (a) Differentiate between the process of advection and molecular diffusion for groundwater pollutant transfer.</p> <p>(b) Suppose 1m³ 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. Assume aqueous solubility of 1.2 DCE is 0.87g/100ml and specific gravity 1.253 g/cc. Determine the retardation factor.</p> <p>(c) Write two methods of investigations for salt water intrusion in aquifer.</p> <p>(d) Discuss mitigation methods of salt water intrusion.</p> <p>Section-B (CO2)</p> <p>Q3. (a) Write true or false with proper justification. <u>No marks will be given if justification will not be written.</u></p> <p>(i) Discharge per unit drawdown of a well is defined as well efficiency.</p> <p>(ii) Head loss through well required to cause laminar porous media flow is known as well loss.</p> <p>(iii) By recovery test we can determine all the aquifer parameters.</p> <p>(iv) Drawdown in well will get double if a well is near an impermeable boundary.</p> <p>(b) Deduce the equation of drawdown in a well completely penetrating in a confined aquifer as a result of unsteady flow to wells.</p> <p>Q4. Determine graphically the transmissibility of aquifer for a confined aquifer if the residual drawdown time data recorded at the pumping well of 30cm diameter having rate of discharge of 40m³/h lpm after 300minutes are:</p>	<p>2+5+ 1+1 +6</p> <p>2 × 2</p> <p>4</p> <p>2</p> <p>5</p> <p>1.5×4</p> <p>4</p> <p>9</p>

REF NO.-EX/CE/PC/B/T/415C/2024 (S)

B.E.C.E. 4th YEAR EXAMINATION, 20241ST SEMESTER SUPPLEMENTARY

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
	Time since stoppage of pumping (min)	1.0	3.0	5.0	10.0	20.0	40.0	90.0	150	200.0	
	Residual drawdown (m)	1.35	1.18	1.11	1.05	0.98	0.88	0.8	0.7	0.68	