



NATIONAL INSTITUTE OF TECHNOLOGY, ROURKELA -769008
MID-SEMESTER EXAMINATION
SESSION: 2022-2023 (autumn)
B. Tech. 5th Semester

Subject Code: CE3401
 No. of Pages: 01 (One)

Subject: Water Resources Engineering

Full Marks: 60

Dept. Code: CE
 Duration: 2 Hours

Q. No	Particulars (Answer any Five questions)	Marks																																				
1.	<p>The mass curve of rainfall in a storm of total duration 90 minutes is given below. (a) Draw the hyetograph of the storm at 10 minutes time step. (b) Plot the maximum intensity-duration curve for this storm. (c) Plot the maximum depth-duration curve for the storm.</p> <table><tr><td>Time(Minutes)</td><td>0</td><td>10</td><td>20</td><td>30</td><td>40</td><td>50</td><td>60</td><td>70</td><td>80</td><td>90</td></tr><tr><td>Cumulative Rainfall (mm)</td><td>0</td><td>2.1</td><td>6.3</td><td>14.5</td><td>21.7</td><td>27.9</td><td>33.0</td><td>35.1</td><td>36.2</td><td>37.0</td></tr></table>	Time(Minutes)	0	10	20	30	40	50	60	70	80	90	Cumulative Rainfall (mm)	0	2.1	6.3	14.5	21.7	27.9	33.0	35.1	36.2	37.0	12														
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Cumulative Rainfall (mm)	0	2.1	6.3	14.5	21.7	27.9	33.0	35.1	36.2	37.0																												
2.	<p>What is return period and what is significance of it? A one-day rainfall of 20.0 cm at a place X was found to have a period of 100 years. Calculate the probability that a one-day rainfall of magnitude equal to or larger than 20.0 cm: (i) Will not occur at station X during the next 50 years. (ii) Will occur in the next year.</p>	12																																				
3.	<p>Determine the best values of the parameters of Horton's infiltration capacity equation for the following data pertaining to infiltration tests on a soil using double ring infiltrometer.</p> <table><tr><td>Time since start(minutes)</td><td>5</td><td>10</td><td>15</td><td>25</td><td>40</td><td>60</td><td>75</td><td>90</td><td>110</td><td>130</td></tr><tr><td>Cumulative Infiltration (mm)</td><td>21.0</td><td>36.0</td><td>47.6</td><td>56.9</td><td>63.8</td><td>69.8</td><td>74.8</td><td>79.3</td><td>87.0</td><td>92.0</td></tr></table>	Time since start(minutes)	5	10	15	25	40	60	75	90	110	130	Cumulative Infiltration (mm)	21.0	36.0	47.6	56.9	63.8	69.8	74.8	79.3	87.0	92.0	12														
Time since start(minutes)	5	10	15	25	40	60	75	90	110	130																												
Cumulative Infiltration (mm)	21.0	36.0	47.6	56.9	63.8	69.8	74.8	79.3	87.0	92.0																												
4.	<p>The mass curve of an isolated storm in a 500ha watershed is as follows:</p> <table><tr><td>Time from start (h)</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 (cm)</td><td>0</td><td>0.8</td><td>2.6</td><td>2.8</td><td>4.1</td><td>7.3</td><td>10.8</td><td>11.8</td><td>12.4</td><td>12.6</td></tr></table> <p>If the direct runoff produced by the storm is measured at the outlet of the watershed as 0.34Mm³, estimate the phi-index of the storm and duration of rainfall excess.</p>	Time from start (h)	0	2	4	6	8	10	12	14	16	18	Cumulative Rainfall (cm)	0	0.8	2.6	2.8	4.1	7.3	10.8	11.8	12.4	12.6	12														
Time from start (h)	0	2	4	6	8	10	12	14	16	18																												
Cumulative Rainfall (cm)	0	0.8	2.6	2.8	4.1	7.3	10.8	11.8	12.4	12.6																												
5.	<p>With neat sketch describe the horizontal-axis and vertical-axis current meters. What is two-step method of discharge measurement and two-point method of velocity measurement?</p>	12																																				
6.	<p>The stage-discharge data of a river are given below. Establish the stage-discharge relationship to predict the discharge for a given stage. Assume the value of stage for zero discharge as 35.00m. Also estimate the discharge corresponding to stage values of 42.50m and 48.50m respectively.</p> <table><tr><td>Stage (m)</td><td>Discharge (m³/s)</td><td>Stage (m)</td><td>Discharge (m³/s)</td><td>Stage (m)</td><td>Discharge (m³/s)</td></tr><tr><td>35.91</td><td>89</td><td>43.53</td><td>2800</td><td>49.05</td><td>6800</td></tr><tr><td>36.90</td><td>230</td><td>44.40</td><td>3800</td><td>49.55</td><td>6900</td></tr><tr><td>37.92</td><td>360</td><td>45.40</td><td>4560</td><td>49.68</td><td>6950</td></tr><tr><td>39.07</td><td>469</td><td>46.43</td><td>5305</td><td></td><td></td></tr><tr><td>41.00</td><td>798</td><td>48.02</td><td>5900</td><td></td><td></td></tr></table>	Stage (m)	Discharge (m ³ /s)	Stage (m)	Discharge (m ³ /s)	Stage (m)	Discharge (m ³ /s)	35.91	89	43.53	2800	49.05	6800	36.90	230	44.40	3800	49.55	6900	37.92	360	45.40	4560	49.68	6950	39.07	469	46.43	5305			41.00	798	48.02	5900			12
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Best of Luck