Total number of printed pages: 2 **D/6th Semester/DCE 612**

2024

WATER RESOURCE ENGINEERING

Full Marks: 100

Time: Three hours

The figures in the margin indicate full marks for the questions.

*Answer **any five** questions.*

"Illustrate answers with real sketches whenever required"

<table>
<tr><td>1.</td><td>a)</td><td>What is hydrological circle? Classify the rain fall based on their intensity.</td><td>1+3 = 4</td></tr>
<tr><td></td><td>b)</td><td>Write about the different methods of presentation of rainfall data.</td><td>8</td></tr>
<tr><td></td><td>c)</td><td>Describe the different methods available for measuring rainfall?</td><td>8</td></tr>
<tr><td>2.</td><td>a)</td><td>Differentiate between discontinuity and inconsistency in rain fall data. How the missing rain fall data can be estimated?</td><td>10</td></tr>
<tr><td></td><td>b)</td><td>How the average depth of rain fall over an area can be determined?</td><td>10</td></tr>
<tr><td>3.</td><td>a)</td><td>What are the different techniques available for measuring the stream flow? How the measurement of stage of a river can be made?</td><td>2+8=10</td></tr>
<tr><td></td><td>b)</td><td>The recorded rainfall at 4 rain gauge stations in an area for a period of 8 years is given below. Estimate the missing rainfall at station X in the year 1991 using (i) Arithmetic mean method and (ii) Normal-ratio method.
<table>
<tr><th rowspan="2">Year</th><th colspan="4">Annual rainfall in cm at the 4 raingauge stations</th></tr>
<tr><th>X</th><th>A</th><th>B</th><th>C</th></tr>
<tr><td>1991</td><td>-</td><td>57.7</td><td>63.0</td><td>44.2</td></tr>
<tr><td>1992</td><td>121.0</td><td>108.3</td><td>100.9</td><td>95.1</td></tr>
<tr><td>1993</td><td>95.0</td><td>75.3</td><td>90.5</td><td>60.4</td></tr>
<tr><td>1994</td><td>69.0</td><td>67.5</td><td>58.6</td><td>62.3</td></tr>
<tr><td>1995</td><td>86.0</td><td>55.7</td><td>69.6</td><td>80.3</td></tr>
<tr><td>1996</td><td>59.9</td><td>52.3</td><td>75.4</td><td>85.1</td></tr>
<tr><td>1997</td><td>50.3</td><td>46.1</td><td>62.5</td><td>40.3</td></tr>
<tr><td>1998</td><td>34.8</td><td>47.6</td><td>52.0</td><td>30.1</td></tr>
</table></td><td>10</td></tr>
</table>

4.	a)	How the stream flow measurement of a river can be done by using area-velocity method?	10
	b)	What is hydrograph? Explain the different components of a flood hydrograph with help of a sketch.	2+8=10
5.	a)	The peak of flood hydrograph due to 3- hour duration isolated storm in a catchment is 270m^3/s. the total depth of rainfall is 5.9 cm. Assuming an average infiltration loss of 0.3 cm/ hour and constant base flow of 20 m^3/s; estimate the peak 3-hr unit hydrograph of the catchment. If the area of catchment is 567 km^2 then determine the base width of 3-hour unit hydrograph by assuming it to be triangular in shape.	10
	b)	What are the assumptions made in the Unit Hydrograph Theory? Describe the various factors affecting flood hydrograph.	3+7=10
6.	a)	What are the sources of ground water flow? What is the difference between infiltration and percolation?	2+3=5
	b)	A 30 cm diameter well completely penetrates a confined aquifer of permeability 45 m/day. The length of the strainer is 20 m. Under steady state of pumping, the drawdown of the well was found to be 3.0 m and the radius of influence was 300 m. Calculate the discharge.	5
	c)	Describe the different aquifer properties?	10
7.	Write short notes on any four of the following,		4x5=20
	a)	Evapotranspiration	
	b)	Probable maximum rainfall	
	c)	Darcy's Law	
	d)	Unit hydrograph	
	e)	Hyetograph	
	f)	Rain gauge	

.....