SRM VALLIAMMAI ENGINEERING COLLEGE

(An Autonomous Institution)

SRM Nagar, Kattankulathur – 603 203

DEPARTMENT OF CIVIL ENGINEERING

QUESTION BANK

VII SEMESTER

1903710- HYDROLOGY AND WATER RESOURCES ENGINEERING

B.E. CIVIL ENGINEERING

Regulations – 2019

Academic Year: 2022– 2023

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1903710 HYDROLOGY AND WATER RESOURCES ENGINEERING

Question Bank

SEMESTER: 07 REGULATION-2019 YEAR: B.E /IV

UNIT I PRECIPITATION AND ABSTRACTIONS

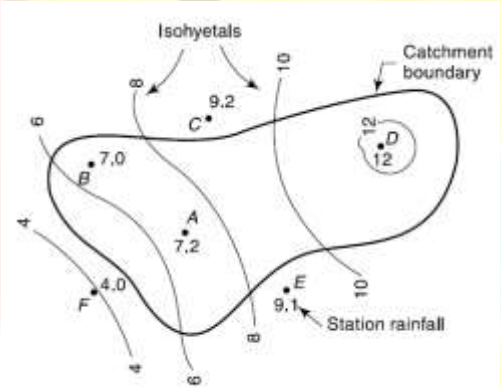
Hydrological cycle- Meteorological measurements – Requirements, types and forms of precipitation - Rain gauges-Spatial analysis of rainfall data using Thiessen and Isohyetal methods-Interception - Evaporation. Horton's equation, pan evaporation measurements and evaporation suppression - Infiltration-Horton's equation - double ring infiltrometer, infiltration indices

PART-A (2MARKS)

Q. No	Questions	BT Level	Competence
1.	Define Hydrology.	BT-1	Remember
2.	What is the objective of the hydrological study?	BT-1	Remember
3.	What is the importance of hydrology?	BT-1	Remember
4.	List the various phases of a hydrological cycle?	BT-1	Remember
5.	Define Precipitation?	BT-1	Remember
6.	How precipitation is expressed?	BT-1	Remember
7.	State basic conditions which are required for the precipitation to occur.	BT-1	Remember
8.	Define transpiration?	BT-1	Remember
9.	What is runoff?	BT-1	Remember
10.	Enlist the various forms of precipitation.	BT-2	Understand
11.	What are all the types of precipitation?	BT-2	Understand
12.	How the precipitation can be measured?	BT-2	Understand
13.	What are all the demerits of Non-recording type rain gauge?	BT-2	Understand
14.	Enlist the three types of recording type rain gauge?	BT-2	Understand
15.	What do you understand by Isohyet?	BT-2	Understand
16.	Write the Horton's Equation.	BT-2	Understand
17.	What are all the methods available to find the average depth of precipitation over an area?	BT-3	Application
18.	What do you understand from infiltration indices?	BT-3	Application
19.	What is the use of Double mass curve?	BT-3	Application
20.	Write short notes on rain gauge density	BT-3	Application

21.	Define infiltration?	BT-3	Application
22.	Define evaporation?	BT-3	Application
23.	What is normal Annual rainfall?	BT-3	Application
24.	List the merits of Isohyetal method.	BT-3	Application
25.	How Orographic precipitation occurs?	BT-3	Application

PART-B (13 MARKS)

Q.No	Questions	BT Level	Competence
1.	Explain "Hydrological cycle" with neat sketch.	BT-3	Application
2.	The isohyets due to a storm in a catchment were drawn in the figure and the area of the catchment bounded by Isohyets was tabulated as below. Isohyets (cm) / Area (km^2) Station-12.0 / 30 12.0-10.0 / 140 10.0-8.0 / 80 8.0-6.0 / 180 6.0-4.0 / 20  Isohyetals of a Storm Estimate the mean precipitation due to storm.	BT-3	Application
3.	List the different types of evaporation and explain the factors affecting evaporation in detail.	BT-3	Application
4.	Estimate the PET of an area for the season November to February in which wheat is grown. The area is in North India at latitude of 30º N with mean monthly temperatures as below. Month / Nov. / Dec. / Jan. / Feb. Temp. (ºC) / 16.5 / 13.0 / 11.0 / 14.5 Assume empirical coefficient K=0.6, and Monthly percent of total day time hours of the year 7.19, 7.15, 7.3, 7.03 for Nov., Dec., Jan., Feb respectively. Use the Blaney-Criddle formula.	BT-4	Analyse

<table>
<tr><td>5.</td><td>Results of an infiltrometer test on a soil are given below. Determine the Horton's infiltration capacity equation for this soil.
<table>
<tr><td>Time since start in (h)</td><td>0.25</td><td>0.5</td><td>0.75</td><td>1</td><td>1.25</td><td>1.5</td><td>1.75</td><td>2</td></tr>
<tr><td>Infiltration capacity in cm/h</td><td>5.6</td><td>3.2</td><td>2.1</td><td>1.50</td><td>1.20</td><td>1.10</td><td>1.0</td><td>1.0</td></tr>
</table></td><td>BT-4</td><td>Analyse</td></tr>
<tr><td>6.</td><td>The rain gauge station X was in operative for a part of a month during storm occurred. The storm rainfall recorded at the three surrounding stations A, B, and C was 75, 55, and 85 mm respectively. If the average annual rainfall of the stations A, B, C, and X are 780, 660,850 and 700 mm respectively. Estimate the storm rainfall of station X.</td><td>BT-4</td><td>Analyse</td></tr>
<tr><td>7.</td><td>The rain fall recorded at the various rain gauge stations are as follows.
<table>
<tr><th>Rain gauge station number</th><th>Precipitation in mm</th></tr>
<tr><td>1</td><td>35</td></tr>
<tr><td>2</td><td>38</td></tr>
<tr><td>3</td><td>41</td></tr>
<tr><td>4</td><td>45</td></tr>
<tr><td>5</td><td>47</td></tr>
<tr><td>6</td><td>50</td></tr>
<tr><td>7</td><td>52</td></tr>
<tr><td>8</td><td>55</td></tr>
</table>
Determine the average rainfall over the catchment</td><td>BT-4</td><td>Analyse</td></tr>
<tr><td>8.</td><td>Determine optimum number of rain gauges in catchment area from following data.
• No. of existing rain gauge = 7
• Mean annual rain fall at the gauges are 1010, 980,900,870, 850, 800, 700 mm.
Permissible error = 8 %</td><td>BT-3</td><td>Application</td></tr>
<tr><td>9.</td><td>Explain the process of infiltration and factor affecting its process.</td><td>BT-3</td><td>Application</td></tr>
<tr><td>10.</td><td>Describe the methods of determining the average depth of rainfall over an area.</td><td>BT-4</td><td>Analyse</td></tr>
<tr><td>11.</td><td>For a drainage basis of 600 km^2, isohyets drawn for a storm gave the following data:
<table>
<tr><td>Isohyets (cm)</td><td>40</td><td>35</td><td>30</td><td>25</td><td>20</td><td>15</td><td>10</td></tr>
<tr><td>Catchment area (km2)</td><td>-</td><td>35</td><td>90</td><td>150</td><td>310</td><td>430</td><td>600</td></tr>
</table>
Estimate the avg. depth of precipitation over the basin.</td><td>BT-4</td><td>Analyse</td></tr>
<tr><td>12.</td><td>The infiltration capacities of an area at different intervals of time are indicated below. Find an equation for the infiltration capacity in the exponential form.
<table>
<tr><td>Time (hrs)</td><td>0</td><td>0.25</td><td>0.50</td><td>0.75</td><td>1.00</td><td>1.25</td><td>1.50</td><td>1.75</td><td>2.00</td></tr>
<tr><td>Infiltration capacity (cm/hr)</td><td>10.5</td><td>5.65</td><td>3.20</td><td>2.18</td><td>1.50</td><td>1.25</td><td>1.10</td><td>1.0</td><td>1.0</td></tr>
</table></td><td>BT-4</td><td>Analyse</td></tr>
</table>

13.	Describe the working principle of a non-recording type rain gauge with neat sketch, Mentioning its advantages and disadvantages.	BT-3	Application
14.	What are the factors affecting the infiltration capacity of soil and discuss briefly the effect of any four?	BT-3	Application
15.	Explain the different methods of determining the average rainfall over a catchment due to a storm. Discuss the relative merits and demerits of the various methods.	BT-3	Application
16.	What are the various types of precipitation and how do you measure rain fall?	BT-3	Application
17.	Write down the Horton's equation for the determination of rate of filtration.	BT-3	Application

PART-C (15 MARKS)

Q.No	Questions	BT Level	Competence
1.	Discuss the application of hydrology in practice	BT-4	Analyse
2.	Explain the process of evapotranspiration and its measurement.	BT-4	Analyse
3.	Explain any two Automatic Rain gauges.	BT-4	Analyse
4.	What are the precautions to be taken in selection a site for the location of a rain gauge? Explain.	BT-4	Analyse
5.	As the rainfall supply continues, the rate of infiltration decreases, why?	BT-5	Evaluate

UNIT II RUNOFF

Watershed, catchment and basin - Catchment characteristics - factors affecting runoff - Run off estimation using empirical - Strange"s table and SCS methods – Stage discharge relationships- flow measurements- Hydrograph – Unit Hydrograph – IUH

PART-A (2MARKS)

Q.No	Questions	BT Level	Competence
1.	What is interflow?	BT-1	Remember
2.	What is base flow?	BT-1	Remember
3.	Define Effective Rainfall.	BT-1	Remember
4.	List the climatic factors which affect runoff.	BT-1	Remember

5.	Define Direct Runoff.	BT-1	Remember
6.	List the methods of estimation of rainfall.	BT-1	Remember
7.	Distinguish between runoff and stream flow.	BT-1	Remember
8.	What do you understand by ground water flow?	BT-1	Remember
9.	Define Runoff.	BT-1	Remember
10.	List the physiographic factors which affect runoff.	BT-1	Remember
11.	Define Annual hydrograph.	BT-2	Understand
12.	What are the methods to determine unit hydrograph?	BT-2	Understand
13.	What are all the applications of unit hydrograph?	BT-2	Understand
14.	Enumerate the types of synthetic hydrographs.	BT-2	Understand
15.	List the factors affecting hydrograph.	BT-2	Understand
16.	What are the limitations of unit hydrograph theory?	BT-2	Understand
17.	List the types of hydrograph.	BT-2	Understand
18.	Define subsurface runoff.	BT-2	Understand
19.	What is isochrones?	BT-3	Application
20.	What do you understand by surface runoff?	BT-3	Application
21.	Define concentration time.	BT-3	Application
22.	What is drainage density?	BT-3	Application
23.	Define Base lag time.	BT-3	Application
24.	Define S curve technique.	BT-3	Application
25.	Enumerate the main components of a hydrograph of discharge against time.	BT-3	Application

PART-B (13 MARKS)

Q.No	Questions	BT Level	Competence
1.	Explain in detail about the runoff process.	BT-5	Evaluate
2.	List the factors affecting runoff and elaborate in detail	BT-5	Evaluate

3.	Elaborate components of hydrograph also explain in detail about the characteristics of streams.		
4.	Rainfall data of a magnitude 4 cm and 5cm occurring non two consecutive 4 hr duration of catchment area 25 km^2 . Produce the following hydrograph at an outlet of the catchment and estimate the rainfall and Ø-index. Draw the graph also.	BT-4	Analyse
5.	Annual runoff and runoff values (in cm) of a catchment spanning a period of 21 years are given below. (a) Analyse the data to estimate the 75% and 50% dependable annual yield of the catchment and (b) to develop a linear correlation equation to estimate annual runoff volume for a given annual rainfall value.	BT-4	Analyse

Time from the start of Rainfall	-6	0	6	12	18	24	30	36	42	48	54	60	66
Observed flow	7	5	13	26	21	16	12	9	7	5	5	4	4

Year	Annual rainfall (cm)	Annual runoff (cm)	Year	Annual rainfall (cm)	Annual runoff (cm)
1975	118	54	1986	75	17
1976	98	45	1987	107	32
1977	112	51	1988	75	15
1978	97	41	1989	93	28
1979	84	21	1990	129	48
1980	91	32	1991	153	76
1981	138	66	1992	92	27
1982	89	25	1993	84	18
1983	104	42	1994	121	52
1984	80	11	1995	95	26
1985	97	32			

<table>
<tr><td>6.</td><td>Monthly rainfall value of the 50% dependable year at a site selected for construction of an irrigation tank is given below. Estimate the monthly and annual runoff volume of the catchment area 1500 ha.

<table><tr><td>Month</td><td>June</td><td>July</td><td>Aug</td><td>Sep</td><td>Oct</td></tr><tr><td>Monthly rainfall (mm)</td><td>90</td><td>160</td><td>145</td><td>22</td><td>240</td></tr></table></td><td>BT-4</td><td>Analyse</td></tr>
<tr><td>7.</td><td>In a 350 ha watershed the CN value was assed as 70 for AMC-III. Estimate the value of direct runoff volume for the following 4 Days of rainfall. The AMC on july 1st was of category III. Use standard SCS-CN equations.

<table><tr><td>Date</td><td>July 1</td><td>July 2</td><td>July 3</td><td>July4</td></tr><tr><td>Rainfall (mm)</td><td>50</td><td>20</td><td>30</td><td>18</td></tr></table>
What would be the runoff volume if the CN_{III} value were 80?</td><td>BT-4</td><td>Analyse</td></tr>
<tr><td>8.</td><td>A small watershed is 250 ha in size has group C Soil. The land cover can be classified as 30% open forest and 70% of poor quality pasture. Assuming AMC at average condition and the soil to be black soil. Estimate the direct runoff volume due to a rainfall of 75mm in one day.</td><td>BT-3</td><td>Application</td></tr>
<tr><td>9.</td><td>The ordinates of storm hydrograph of a particular catchment are given below. Determine the ordinates of unit hydrograph and rainfall excess. Take catchment area as 50 km^2

<table><tr><td>Time hr</td><td>0</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td></tr><tr><td>SHO (m^3/s)</td><td>10</td><td>30</td><td>40</td><td>60</td><td>80</td><td>70</td><td>55</td><td>40</td><td>10</td></tr><tr><td>Base flow (m^3/s)</td><td>10</td><td>10</td><td>10</td><td>10</td><td>10</td><td>10</td><td>10</td><td>10</td><td>10</td></tr></table></td><td>BT-3</td><td>Application</td></tr>
<tr><td>10.</td><td>For a catchment area of 230 km^2 the discharge in stream is given below. Calculate unit hydrograph ordinates and rainfall excess.
<table><tr><td>Date</td><td>Oct.15</td><td>Oct.15</td><td>Oct.15</td><td>Oct.15</td><td>Oct.16</td><td>Oct.16</td><td>Oct.16</td><td>Oct.16</td><td>Oct.17</td></tr><tr><td>Time</td><td>0000</td><td>0600</td><td>1200</td><td>1800</td><td>0000</td><td>0600</td><td>1200</td><td>1800</td><td>0000</td></tr><tr><td>SHO (m^3/s)</td><td>15</td><td>90</td><td>705</td><td>227</td><td>148</td><td>94</td><td>61</td><td>35</td><td>15</td></tr><tr><td>Base flow (m^3/s)</td><td>15</td><td>10</td><td>5</td><td>7</td><td>8</td><td>9</td><td>11</td><td>13</td><td>15</td></tr></table></td><td>BT-4</td><td>Analyse</td></tr>
</table>

11.	Explain ground water runoff in detail.	BT-4	Analyse
12.	Discuss the several assumptions underlying the UH method in hydrological analysis.	BT-4	Analyse
13.	Explain the climatic factors which affect the runoff.	BT-4	Analyse
14.	Explain in detail about the method of superposition.	BT-5	Evaluate
15.	What are the factors affecting hydrograph? Explain.	BT-5	Evaluate
16.	What is a hydrograph? Draw a single peaked hydrograph and explain its components.	BT-5	Evaluate
17.	Explain climatic factors which affect runoff.	BT-5	Evaluate

PART-C (15 MARKS)

<table>
<tr><th>Q.No</th><th>Questions</th><th>BT Level</th><th>Competence</th></tr>
<tr><td>1.</td><td>The land use and soil characteristics of a 5000 ha watersheds are as follows.
Soil: Not a black soil. Hydrologic soil classification : 60% is group B and 40% is group C
Land use:
Hard surface area 10%
Waste land 5%
Orchard (without understory cover) = 30%
Cultivated (Terraced) Poor condition = 55%
Antecedent rain: The total rainfall in past 5 days was 30 mm. the season is dormant season.
I. Compute the runoff volume from a 125 mm rainfall in a day on the watershed.
II. What would have been the runoff if the rainfall in the previous 5 days was 10mm?</td><td>BT-4</td><td>Analyse</td></tr>
<tr><td>2.</td><td>The runoff data at a gauging station of flood are given below. The drainage area is 40km^2; the duration of rainfall is 3 hrs. Derive the 3 Hours unit hydrograph for the basin and plot it.
<table>
<tr><th>S. No.</th><th>Date</th><th>Time</th><th>Discharge</th></tr>
<tr><td>1</td><td rowspan="8">Day 1</td><td>2</td><td>50</td></tr>
<tr><td>2</td><td>5</td><td>47</td></tr>
<tr><td>3</td><td>8</td><td>75</td></tr>
<tr><td>4</td><td>11</td><td>120</td></tr>
<tr><td>5</td><td>14</td><td>225</td></tr>
<tr><td>6</td><td>17</td><td>290</td></tr>
<tr><td>7</td><td>20</td><td>270</td></tr>
<tr><td>8</td><td>23</td><td>145</td></tr>
<tr><td>9</td><td rowspan="2">Day 2</td><td>2</td><td>110</td></tr>
<tr><td>10</td><td>5</td><td>90</td></tr>
</table></td><td>BT-4</td><td>Analyse</td></tr>
</table>

		11		8	80		
		12		11	70		
		13		14	60		
		14		17	59		
		15		20	56		
		16		23	57		
3.	Explain in detail about the synthetic unit hydrograph method.					BT-5	Evaluate
4.	The following characteristic for a given water shed used to develop two hours unit hydrograph from a basin having the water shed area of 400 km^2, the length of the main stream from the basin outlet to the point of string which is nearest to the centroid of basin is 25 km. The coefficient Cp=0.576 and Ct=1.257.					BT-4	Analyse
5.	What is a dimensionless unit hydrograph? How is it useful in constructing a synthetic unit hydrograph of a basin?					BT-5	Evaluate

UNIT III FLOOD AND DROUGHT

Natural Disasters-Flood Estimation- Frequency analysis- Flood control- Definitions of droughts- Meteorological, hydrological and agricultural droughts- IMD method-NDVI analysis- Drought Prone Area Programme (DPAP)

PART-A (2MARKS)

Q.No	Questions	BT Level	Competence
1.	State the two attributes of the flood.	BT-1	Remember
2.	What is Maximum Probable flood?	BT-1	Remember
3.	What do you understand by the term Design flood?	BT-1	Remember
4.	List the methods of estimation of flood.	BT-1	Remember
5.	What is frequency of flood?	BT-1	Remember
6.	Define recurrence interval of flood.	BT-1	Remember
7.	A flood has return period of 23 years. What is probability exceedance of the flood?	BT-2	Understand
8.	Define standard Project flood.	BT-2	Understand
9.	According to Gumbel's extreme value distribution, how the probability of occurrence of a flood peak of magnitude greater than or equal to Q is expressed?	BT-2	Understand
10.	What are the uses of flood flow frequency analysis?	BT-2	Understand
11.	What is the use of frequency analysis?	BT-2	Understand
12.	Define flood.	BT-2	Understand
13.	State any two formulas for to calculate flood discharge.	BT-2	Understand

14.	Write short notes on flood control measures.	BT-2	Understand
15.	A flood of a certain magnitude has return period of 25 years. What is the probability of exceedance?	BT-2	Understand
16.	What are the uses of flood flow frequency analysis?	BT-2	Understand
17.	What are the routing methods?	BT-1	Remember
18.	What is flood routing?	BT-1	Remember
19.	What are the basic equations used for flood routing by hydrograph method?	BT-1	Remember
20.	What is attenuation?	BT-3	Application
21.	Define storage coefficient with reference to the channel routing.	BT-3	Application
22.	List the different methods of reservoir routing.	BT-3	Application
23.	List the structural flood control methods.	BT-3	Application
24.	What is prism storage?	BT-1	Remember
25.	Define lag.	BT-1	Remember

PART-B (13 MARKS)

<table>
<tr><th>Q.No</th><th>Questions</th><th>BT Level</th><th>Competence</th></tr>
<tr><td>1.</td><td>Explain in detail about the various flood control measures and different types of droughts.</td><td>BT-5</td><td>Evaluate</td></tr>
<tr><td>2.</td><td>Describe the various steps involved in method of reservoir routing. Explain any one of the method in detail.</td><td>BT-5</td><td>Evaluate</td></tr>
<tr><td>3.</td><td>The inflow discharge during a flood in that channel has been given below.
Take k = 12 hours, x= 0.2; λt = 6 hours. Outflow discharge is 20 m^3/s. Determine the routed hydrograph and plot it. Also calculate the reduction in peak and lag time for peak.
<table>
<tr><td>Time</td><td>0</td><td>6</td><td>12</td><td>18</td><td>24</td><td>30</td><td>36</td><td>42</td><td>48</td><td>54</td></tr>
<tr><td>Inflow m^3/s</td><td>15</td><td>26</td><td>55</td><td>68</td><td>57</td><td>44</td><td>37</td><td>29</td><td>21</td><td>18</td></tr>
</table>
</td><td>BT-4</td><td>Analyse</td></tr>
<tr><td>4.</td><td>List out the nonstructural methods of flood control explain in detail any one of the method.</td><td>BT-3</td><td>Application</td></tr>
<tr><td>5.</td><td>Elaborate on drought-prone area programme and agro-climatic planning.</td><td>BT-3</td><td>Application</td></tr>
<tr><td>6.</td><td>How do DPAP programmes help in the development of dry land agriculture in India?</td><td>BT-3</td><td>Application</td></tr>
<tr><td>7.</td><td>Explain in detail about NDVI analysis.</td><td>BT-3</td><td>Application</td></tr>
<tr><td>8.</td><td>A flood of a certain magnitude has a return period of 50 years. Determine the probability exceedance and probability of the flood of</td><td></td><td></td></tr>
</table>

	magnitude equal to or greater than the given magnitude occurring at least once in 10 successive years, two times in 10 successive years and once in 10 successive years.	BT-4	Analyse
9.	List out the structural methods of flood control explain in detail any one of the method.	BT-3	Application
10.	List the societal impacts of drought and also explain the Factors Aggravating Drought Impacts	BT-3	Application
11.	Find out the peak flood discharge for a return period of 600 years, if the corresponding peak flood discharge for return periods 100 years and 200 years are 225 m^3/s and 400 m^3/s. Use gambels method. Also find the return period of 900m3/s peak discharge.	BT-4	Analyse
12.	Elaborate in detail about methods of estimation of flood.	BT-4	Analyse
13.	Explain various methods of determining flood discharge in a stream.	BT-3	Application
14.	Explain the step by step procedure of log Pearson type III distribution used in flood frequency analysis.	BT-3	Application
15.	Write the types of flooding. Explain any two in detail.	BT-3	Application
16.	How do you determine the magnitude of flood of specific return period using gumbels method?	BT-3	Application
17.	Describe the procedure for estimating a T-year flood using gumbels method.	BT-3	Application

PART-C (15 MARKS)

<table>
<tr><th>Q.No</th><th>Questions</th><th>BT Level</th><th>Competence</th></tr>
<tr><td>1.</td><td>Differentiate between
I. Hydraulic routing and hydrologic routing (5 Marks)
II. Channel routing and reservoir routing (5 Marks)
III. Prism storage and wedge storage (5 Marks)</td><td>BT-3</td><td>Application</td></tr>
<tr><td>2.</td><td>The maximum annual floods for a river for 29 years are given below.
i) Plot the frequency curve
ii) Determine the magnitude of flood having return period of 30 years, 15 years and 7.5 years.
iii) What is recurrence interval of a flood of a 300 m^3/s.
<table>
<tr><th>Year</th><th>Flood m3/s</th><th>Year</th><th>Flood m3/s</th><th>Year</th><th>Flood m3/s</th><th>Year</th><th>Flood m3/s</th></tr>
<tr><td>1955</td><td>375</td><td>1966</td><td>440</td><td>1977</td><td>365</td><td>1988</td><td>267</td></tr>
<tr><td>1956</td><td>199</td><td>1967</td><td>180</td><td>1978</td><td>270</td><td>1989</td><td>252</td></tr>
<tr><td>1957</td><td>232</td><td>1968</td><td>219</td><td>1979</td><td>585</td><td>1990</td><td>475</td></tr>
<tr><td>1958</td><td>419</td><td>1969</td><td>492</td><td>1980</td><td>435</td><td>1991</td><td>360</td></tr>
<tr><td>1959</td><td>245</td><td>1970</td><td>237</td><td>1981</td><td>239</td><td>1992</td><td>290</td></tr>
<tr><td>1960</td><td>411</td><td>1971</td><td>141</td><td>1982</td><td>264</td><td>1993</td><td>450</td></tr>
<tr><td>1961</td><td>166</td><td>1972</td><td>257</td><td>1983</td><td>258</td><td>1994</td><td>555</td></tr>
<tr><td>1962</td><td>232</td><td>1973</td><td>308</td><td>1984</td><td>198</td><td></td><td></td></tr>
<tr><td>1963</td><td>206</td><td>1974</td><td>149</td><td>1985</td><td>523</td><td></td><td></td></tr>
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<tr><td>1965</td><td>238</td><td>1976</td><td>540</td><td>1987</td><td>889</td><td></td><td></td></tr>
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</td><td>BT-4</td><td>Analyse</td></tr>
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3.	A flood of a certain magnitude has a return period of 40 years. Determine the probability exceedance and probability of the flood of magnitude equal to or greater than the given magnitude occurring at least once in 10 successive years, two times in 10 successive years and once in 10 successive years.	BT-4	Analyse
4.	How IMD monitors agricultural droughts and explain in detail?	BT-3	Application
5.	Explain about recurrence interval of flood in detail.	BT-3	Application

UNIT IV RESERVOIRS

Classification of reservoirs, General principles of design, site selection, spillways, elevation – area - capacity - storage estimation, sedimentation –Effect of sedimentation on dams- life of reservoirs.

PART-A (2MARKS)

Q.No	Questions	BT Level	Competence
1.	What is the most important physical characteristics of reservoir?	BT-1	Remember
2.	What are criteria for selection of site for reservoir?	BT-1	Remember
3.	What is the difference between weir and barrage?	BT-1	Remember
4.	Why is leakage under dam undesirable?	BT-1	Remember
5.	Which condition is most Favorable at the site of the dam and reservoir?	BT-1	Remember
6.	Sketch the flow duration curve.	BT-1	Remember
7.	What are the types of dam?	BT-1	Remember
8.	What is reservoir planning?	BT-1	Remember
9.	How do you fix a capacity of reservoir?	BT-1	Remember
10.	What are the three major inputs in reservoir characterization?	BT-1	Remember
11.	What is reservoir Characterization?	BT-1	Remember
12.	What is spillway and its types?	BT-1	Remember
13.	Classify the various zones of storage in a reservoir.	BT-1	Remember
14.	Write down the steps for Water Resources planning.	BT-2	Understand
15.	Which is uncontrolled spillway?	BT-2	Understand
16.	What is reservoir capacity?	BT-2	Understand
17.	Enumerate the factors to be considered in selection of site for reservoir.	BT-2	Understand
18.	How the storage capacity of a reservoir is fixed?	BT-2	Understand
19.	What are the types of flood control reservoirs?	BT-2	Understand
20.	Compare storage and retarding reservoir	BT-2	Understand

21.	Why Spillway?	BT-2	Understand
22.	What is difference between Notch and Weir?	BT-3	Application
23.	Explain the term storage capacity of the reservoir	BT-3	Application
24.	Define Flood Walls.	BT-3	Application
25.	Compare storage and retarding reservoir	BT-3	Application

PART-B (13 MARKS)

Q.No	Questions	BT Level	Competence
1.	Explain in detail about classification of reservoirs.	BT-4	Analyse
2.	Describe about reservoir sedimentation and deposition.	BT-4	Analyse
3.	Write short note on single and multipurpose reservoir with its advantages and disadvantages.	BT-3	Application
4.	Define storage capacity of the reservoir. List out and explain various storage zones of reservoir with neat sketch?	BT-3	Application
5.	Explain in detail about physical characteristics of reservoir.	BT-3	Application
6.	Enumerate the different types of spillway	BT-3	Application
7.	Outline the general principles of design in reservoir.	BT-3	Application
8.	How will you find reservoir capacity using mass curve?	BT-3	Application
9.	Elaborate in detail about reservoir sedimentation control.	BT-3	Application
10.	Show the processes of reservoir operation in detail.	BT-3	Application
11.	Describe in detail about components of dams with neat sketch	BT-4	Analyse
12.	Enumerate the procedure for site selection for reservoir.	BT-4	Analyse
13.	Explain the term "Life of reservoir "in detail.	BT-4	Analyse
14.	How sedimentation reduces the reservoir capacity?	BT-4	Analyse
15.	Describe the various steps involved in any one method of reservoir routing.	BT-4	Analyse
16.	What is the basic principle in the Muskingum method of flood routing? Describe a procedure for estimating the values of the Muskingum coefficients K and x for a stream reach.	BT-4	Analyse
17.	List the different methods of reservoir routing and explain any three in detail.	BT-3	Application

PART-C (15 MARKS)

Q.No	Questions	BT Level	Competence
1.	How GIS associated in determination of site selection for a reservoir?	BT-5	Evaluate
2.	Is used to measure dynamic loads in dams? Suggest your comments.	BT-5	Evaluate
3.	Explain the planning stages adopted in site selection of reservoir.	BT-5	Evaluate

4.	Illustrate in detail about the storage capacity reservoir from mass curve	BT-5	Evaluate
5.	Explain various storage zones of reservoir with neat sketch.	BT-5	Evaluate

UNIT V GROUNDWATER AND MANAGEMENT

Origin- Classification and types - properties of aquifers- governing equations – steady and unsteady flow - artificial recharge - RWH in rural and urban areas

PART-A (2MARKS)

Q.No	Questions	BT Level	Competence
1.	What is ground water?	BT-1	Remember
2.	Name the sources of ground water	BT-1	Remember
3.	Sketch the diagram of division of sub-surface water.	BT-1	Remember
4.	State Darcy's law and its limitation.	BT-1	Remember
5.	Define aquifer	BT-1	Remember
6.	Define hydraulic conductivity of an aquifer and state its units	BT-1	Remember
7.	What is intrinsic permeability and state its units?	BT-1	Remember
8.	What is drawdown?	BT-1	Remember
9.	Distinguish between specific capacities of a well on the specific yield of an aquifer.	BT-1	Remember
10.	What is rainwater harvesting?	BT-2	Understand
11.	What do you understand by pumping test?	BT-2	Understand
12.	Define drawdown	BT-2	Understand
13.	Write the governing equation for groundwater flow	BT-2	Understand
14.	Enumerate the term " Artificial Recharge	BT-2	Understand
15.	Distinguish between aquitard and aquiclude	BT-2	Understand
16.	Define storage coefficient	BT-2	Understand
17.	Write any two properties of aquifer.	BT-2	Understand
18.	Show the equation for steady state flow	BT-2	Understand
19.	What are the advantages of groundwater?	BT-2	Understand
20.	Write about Vadose zone	BT-2	Understand
21.	List the classification of saturated formation.	BT-2	Understand
22.	What do you infer from recuperation test?	BT-3	Application
23.	Obtain the equation for unsteady flow.	BT-3	Application

24.	Outline the need of groundwater management.	BT-3	Application
25.	Why rainwater harvesting is necessary?	BT-3	Application

PART-B (13 MARKS)

Q.No	Questions	BT Level	Competence
1.	Briefly elaborate on the formation constants which characterize an aquifer.	BT-3	Application
2.	Write in detail about leaky artesian aquifer.	BT-3	Application
3.	A field test for permeability consists in observing the required for a tracer to travel between two observation wells. A tracer was found to take 10 hour travel between two wells 50 m apart when the difference in the water surface elevation in them was 0.5 m. The mean particle size of aquifer is 2 mm and the porosity of the medium is 0.3. If kinematic viscosity is $0.01cm^2/s$. Estimate the co efficient of permeability and intrinsic permeability of the aquifer.	BT-3	Application
4.	In a field test time of 6 hours was required for a tracer to travel between two observation wells 42 m apart. If the difference in water table elevation in these wells is 0.85 m and porosity of the aquifer is 20%. Calculate the coefficient of permeability of aquifer.	BT-3	Application
5.	Explain the classification of saturated formation	BT-3	Application
6.	Explain in detail about the Dupuit's theory	BT-4	Analyse
7.	Describe the method of determining the aquifer parameters using the pumping test data.	BT-4	Analyse
8.	Elaborate on the importance of GW and its historical background.	BT-3	Application
9.	Derive the ground water flow equations.	BT-3	Application
10.	A 30 cm diameter well completely penetrates an unconfined aquifer of saturated depth 40 m. After a long period of pumping at a steady rate of 1500 lpm, the drawdown in two observation wells are located at 25 m and 75 m from the pumping well were found to be 3.5 m and 2 m respectively. Determine the transmissibility of the aquifer.	BT-4	Analyse
11.	Explain in detail the Components of a rooftop rainwater harvesting system	BT-4	Analyse
12.	A 20 cm diameter tube well taps an artesian aquifer. Find the yield for a drawdown of 3m at the well. The length of the strainer is 30 m and the coefficient of permeability of aquifer is 35m per day. Assume the radius of influence as 3oo m. If all other conditions remain same, find the percentage change in yield under the following cases. i. The diameter of the well is 40 cm. ii. The drawdown is 6m iii. The permeability is 17.25 m/day.	BT-4	Analyse
13.	Draw a neat sketch and show the various types of aquifers, confining units, wells and interfaces in them along with their equivalent terminology.	BT-5	Evaluate
14.	Enumerate the major reasons for GW level fluctuations.	BT-5	Evaluate

15.	Describe the method of determining the aquifer parameters using the Pumping test data.	BT-3	Application
16.	On the basis of occurrence and field situation, how aquifers are classified in general? With relevant sketches explain in detail the features of such aquifers.	BT-3	Application
17.	How transmissivity and storage coefficient affect well performance?	BT-3	Application

PART-C (15 MARKS)

Q.No	Questions	BT Level	Competence
1.	Sometimes the aquifers may be stratified with different permeability in each stratum. Consider a situation in which the flow is parallel to the stratification. Derive an expression for the transmissibility of such aquifer formation.	BT-4	Analyse
2.	What is the role of GW in hydrologic cycle? Provide the water balance equation and highlight the GW related components in it.	BT-4	Analyse
3.	How can isotope hydrology help in the GW age determination?	BT-5	Evaluate
4.	What are purposes of and methods for artificial GW recharge (AGWR)?	BT-5	Evaluate
5.	List the Factors affecting the Groundwater and explain any two in detail	BT-5	Evaluate