# SRM VALLIAMMAI ENGINEERING COLLEGE

SRM Nagar, Kattankulathur – 603 203

## DEPARTMENT OF AGRICULTURE ENGINEERING

**QUESTION BANK**

**IVSEMESTER**

**1902402- HYDROLOGY AND WATER RESOURCES ENGINEERING**

B.E. AGRICULTURE ENGINEERING

**Regulation – 2019**

**Academic Year: 2020– 2021**

**Mr. S. Karthick**
**Assistant Professor**
**Department of Civil Engineering**

# SRM VALLIAMMAI ENGINEERING COLLEGE

DEPARTMENT OF CIVIL ENGINEERING

**B.E.** AGRICULTURE ENGINEERING

**1902402- HYDROLOGY AND WATER RESOURCES ENGINEERING**

Question Bank

SEMESTER: 04 REGULATION-2019 YEAR: B.E /II

## UNIT I PRECIPITATION AND ABSTRACTIONS

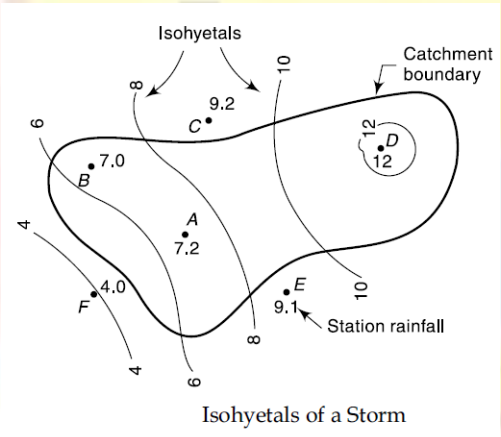
Hydrological cycle- Meteorological measurements – Requirements, types and forms of precipitation - Rain gauges-Spatial analysis of rainfall data using Thiessen and Isohyetal methods-Interception - Evaporation. Horton‟s equation, pan evaporation measurements and evaporation suppression - Infiltration-Horton‟s 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-2 | Understand |
| 8. | Define transpiration? | BT-2 | Understand |
| 9. | What is runoff? | BT-2 | Understand |
| 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-3 | Application |
| 13. | What are all the demerits of Non-recording type rain gauge? | BT-3 | Application |
| 14. | Enlist the three types of recording type rain gauge? | BT-3 | Application |
| 15. | What do you understand by Isohyet? | BT-3 | Application |
| 16. | Write the Horton’s Equation. | BT-4 | Analyse |
| 17. | What are all the methods available to find the average depth of precipitation over an area? | BT-4 | Analyse |
| 18. | What do you understand from infiltration indices. | BT-4 | Analyse |

| | | | |
|---|---|---|---|
| 19. | What is the use of Double mass curve? | BT-4 | Analyse |
| 20. | Write short notes on rain gauge density | BT-5 | Evaluate |
| 21. | Define infiltration? | BT-5 | Evaluate |
| 22. | Define evaporation? | BT-5 | Evaluate |
| 23. | What is normal Annual rainfall? | BT-6 | Create |
| 24. | List the merits of Isohyetal method. | BT-6 | Create |
| 25. | How Orographic precipitation occurs? | BT-6 | Create |

## PART-B (13 MARKS)

| Q.No | Questions | BT Level | Competence |
|---|---|---|---|
| 1. | Explain "Hydrological cycle" with neat sketch. | BT-1 | Remember |
| 2. | The isohyets due to a storm in a catchment were drawn in the figure and the area of the catchment bounded by Isohyets were tabulated as below.<br><br>Isohyets (cm) \| Area ($km^2$)<br>Station-12.0 \| 30<br>12.0-10.0 \| 140<br>10.0-8.0 \| 80<br>8.0-6.0 \| 180<br>6.0-4.0 \| 20<br><br>  <br><br>Isohyetals of a Storm<br><br>Estimate the mean precipitation due to storm. | BT-1 | Remember |
| 3. | Estimate the PET of an area for the season November to February in which wheat is grown. The area is in North India at a latitude of 30º N with mean monthly temperatures as below.<br><br>Month \| Nov. \| Dec. \| Jan. \| Feb.<br>Temp. (ºC) \| 16.5 \| 13.0 \| 11.0 \| 14.5<br><br>Use the Blaney-Criddle formula. | BT-1 | Remember |

<table>
<tr><td>4.</td><td>The infiltration capacity in a basin is represented by Horton's equation as $\mathbf{f_p = 3.0 + e^{-2t}}$<br>Where $f_p$ is in cm/h and t is in hours. Assuming the infiltration to takes place at capacity rates in storm of 60 minutes duration. Estimate the depth of infiltration in (i) The first 30 minutes and (ii) The second 30 minutes of the storm.</td><td>BT-2</td><td>Understand</td></tr>
<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-2</td><td>Understand</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-2</td><td>Understand</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-2</td><td>Understand</td></tr>
<tr><td>8.</td><td>Determine optimum number of rain gauges in catchment area from following data.<br>• No. of existing rain gauge = 7<br>• Mean annual rain fall at the gauges are 1010, 980,900,870, 850, 800, 700 mm.<br>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</td><td>-</td><td>35</td><td>90</td><td>150</td><td>310</td><td>430</td><td>600</td></tr>
</table></td><td>BT-4</td><td>Analyse</td></tr>
</table>

| | | | |
|---|---|---|---|
| | area (km2) | | |
| | Estimate the avg. depth of precipitation over the basin. | | |
| 12. | 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.<br>Time (hrs): 0, 0.25, 0.50, 0.75, 1.00, 1.25, 1.50, 1.75, 2.00<br>Infiltration capacity (cm/hr): 10.5, 5.65, 3.20, 2.18, 1.50, 1.25, 1.10, 1.0, 1.0 | BT-4 | Analyse |
| 13. | Describe the working principle of a non-recording type rain gauge with neat sketch, Mentioning its advantages and disadvantages. | BT-5 | Evaluate |
| 14. | A catchment area of 30 sq. km has one recording gauge. During a storm, the following mass curve of rainfall was recorded:<br>Time from start of storm (Hour): 0, 2, 4, 6, 8, 10, 12, 14<br>Accumulated rainfall (mm): 0, 6, 17, 57, 70, 81, 87, 90<br>If the volume of runoff due to the storm measured is 1.2 x 106 m3 estimate the ø- index of catchment. | BT-6 | Create |

**PART-C (15 MARKS)**

| Q.No | Questions | BT Level | Competence |
|---|---|---|---|
| 1. | Discuss the application Of hydrology in practice | BT-1 | Remember |
| 2. | Explain the process of evapotranspiration and its measurement. | BT-2 | Understand |
| 3. | Explain any two Automatic Raingauges. | BT-4 | Analyse |
| 4. | What are the precautions to be taken in selection a site for the location of a rain gauge? Explain. | 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-2 | Understand |
| 8. | What do you understand by ground water flow? | BT-2 | Understand |
| 9. | Define Runoff. | BT-2 | Understand |
| 10. | List the physiographic factors which affect runoff. | BT-2 | Understand |
| 11. | Define Annual hydrograph. | BT-2 | Understand |
| 12. | What are the methods to determine unit hydrograph? | BT-3 | Application |
| 13. | What are all the applications of unit hydrograph? | BT-3 | Application |
| 14. | Enumerate the types of synthetic hydrographs. | BT-3 | Application |
| 15. | List the factors affecting hydrograph. | BT-3 | Application |
| 16. | What are the limitations of unit hydrograph theory? | BT-4 | Analyse |
| 17. | List the types of hydrograph. | BT-4 | Analyse |
| 18. | Define subsurface runoff. | BT-4 | Analyse |
| 19. | What is isochrones? | BT-4 | Analyse |
| 20. | What do you understand by surface runoff? | BT-5 | Evaluate |
| 21. | Define concentration time. | BT-5 | Evaluate |
| 22. | What is drainage density? | BT-5 | Evaluate |
| 23. | Define Base lag time. | BT-6 | Create |
| 24. | Define S curve technique. | BT-6 | Create |
| 25. | Enumerate the main components of a hydrograph of discharge against time. | BT-6 | Create |

## PART-B (13 MARKS)

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

<table>
<tr><td>3.</td><td>Elaborate components of hydrograph also explain in detail about the characteristics of streams.</td><td>BT-1</td><td>Remember</td></tr>
<tr><td>4.</td><td>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.
<table>
<tr><td>Time from the start of Rainfall</td><td>-6</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><td>60</td><td>66</td></tr>
<tr><td>Observed flow</td><td>7</td><td>5</td><td>13</td><td>26</td><td>21</td><td>16</td><td>12</td><td>9</td><td>7</td><td>5</td><td>5</td><td>4</td><td>4</td></tr>
</table></td><td>BT-2</td><td>Understand</td></tr>
<tr><td>5.</td><td>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.
<table>
<tr><th>Year</th><th>Annual rainfall (cm)</th><th>Annual runoff (cm)</th><th>Year</th><th>Annual rainfall (cm)</th><th>Annual runoff (cm)</th></tr>
<tr><td>1975</td><td>118</td><td>54</td><td>1986</td><td>75</td><td>17</td></tr>
<tr><td>1976</td><td>98</td><td>45</td><td>1987</td><td>107</td><td>32</td></tr>
<tr><td>1977</td><td>112</td><td>51</td><td>1988</td><td>75</td><td>15</td></tr>
<tr><td>1978</td><td>97</td><td>41</td><td>1989</td><td>93</td><td>28</td></tr>
<tr><td>1979</td><td>84</td><td>21</td><td>1990</td><td>129</td><td>48</td></tr>
<tr><td>1980</td><td>91</td><td>32</td><td>1991</td><td>153</td><td>76</td></tr>
<tr><td>1981</td><td>138</td><td>66</td><td>1992</td><td>92</td><td>27</td></tr>
<tr><td>1982</td><td>89</td><td>25</td><td>1993</td><td>84</td><td>18</td></tr>
<tr><td>1983</td><td>104</td><td>42</td><td>1994</td><td>121</td><td>52</td></tr>
<tr><td>1984</td><td>80</td><td>11</td><td>1995</td><td>95</td><td>26</td></tr>
<tr><td>1985</td><td>97</td><td>32</td><td></td><td></td><td></td></tr>
</table></td><td>BT-2</td><td>Understand</td></tr>
</table>

<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.<br><br><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-2</td><td>Understand</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.<br><br><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><br>What would be the runoff volume if the $CN_{III}$ value were 80?</td><td>BT-2</td><td>Understand</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 $km^2$<br><br><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.<br><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 |

**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.<br>Soil: Not a black soil. Hydrologic soil classification : 60% is group B and 40% is group C<br>Land use:<br>Hard surface area 10%<br>Waste land 5%<br>Orchard (without understory cover) = 30%<br>Cultivated (Terraced) Poor condition = 55%<br>Antecedent rain: The total rainfall in past 5 days was 30 mm. the season is dormant season.<br>I. Compute the runoff volume from a 125 mm rainfall in a day on the watershed.<br>II. What would have been the runoff if the rainfall in the previous 5 days was 10mm?</td><td>BT-1</td><td>Remember</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="8">Day 2</td><td>2</td><td>110</td></tr>
<tr><td>10</td><td>5</td><td>90</td></tr>
<tr><td>11</td><td>8</td><td>80</td></tr>
<tr><td>12</td><td>11</td><td>70</td></tr>
<tr><td>13</td><td>14</td><td>60</td></tr>
<tr><td>14</td><td>17</td><td>59</td></tr>
<tr><td>15</td><td>20</td><td>56</td></tr>
<tr><td>16</td><td>23</td><td>57</td></tr>
</table></td><td>BT-2</td><td>Understand</td></tr>
</table>

| | | | |
|---|---|---|---|
| 3. | Explain in detail about the synthetic unit hydrograph method. | BT-4 | Analyse |
| 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-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-3 | Application |
| 13. | State any two formulas for to calculate flood discharge. | BT-3 | Application |
| 14. | Write short notes on flood control measures. | BT-3 | Application |
| 15. | A flood of a certain magnitude has return period of 25 years. What is the probability of exceedance? | BT-3 | Application |
| 16. | What are the uses of flood flow frequency analysis? | BT-4 | Analyse |
| 17. | What are the routing methods? | BT-4 | Analyse |
| 18. | What is flood routing? | BT-4 | Analyse |

| | | | |
|---|---|---|---|
| 19. | What are the basic equations used for flood routing by hydrograph method? | BT-4 | Analyse |
| 20. | What is attenuation? | BT-5 | Evaluate |
| 21. | Define storage coefficient with reference to the channel routing. | BT-5 | Evaluate |
| 22. | List the different methods of reservoir routing. | BT-5 | Evaluate |
| 23. | List the structural flood control methods. | BT-6 | Create |
| 24. | What is prism storage? | BT-6 | Create |
| 25. | Define lag. | BT-6 | Create |

**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-1</td><td>Remember</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-1</td><td>Remember</td></tr>
<tr><td>3.</td><td>The inflow discharge during a flood in that channel has been given below.<br>Take k = 12 hours, x= 0.2; $\lambda t$ = 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-1</td><td>Remember</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-1</td><td>Remember</td></tr>
<tr><td>5.</td><td>Elaborate on drought-prone area programme and agro-climatic planning.</td><td>BT-2</td><td>Understand</td></tr>
<tr><td>6.</td><td>How do DPAP programmes help in the development of dry land agriculture in India?</td><td>BT-2</td><td>Understand</td></tr>
<tr><td>7.</td><td>Explain in detail about NDVI analysis.</td><td>BT-2</td><td>Understand</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 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.</td><td>BT-2</td><td>Understand</td></tr>
<tr><td>9.</td><td>List out the structural methods of flood control explain in detail any one of the method.</td><td>BT-3</td><td>Application</td></tr>
<tr><td>10.</td><td>List the societal impacts of drought and also explain the Factors Aggravating Drought Impacts</td><td>BT-3</td><td>Application</td></tr>
</table>

| | | | |
|---|---|---|---|
| 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-5 | Evaluate |
| 14. | Explain the step by step procedure of log Pearson type III distribution used in flood frequency analysis. | BT-6 | Create |

**PART-C (15 MARKS)**

| Q.No | Questions | BT Level | Competence |
|---|---|---|---|
| 1. | Differentiate between<br>I. Hydraulic routing and hydrologic routing (5 Marks)<br>II. Channel routing and reservoir routing (5 Marks)<br>III. Prism storage and wedge storage (5 Marks) | BT-1 | Remember |
| 2. | The maximum annual floods for a river for 26 years are given below.<br>i) Plot the frequency curve<br>ii) Determine the magnitude of flood having return period of 30 years, 15 years and 7.5 years.<br>iii) What is recurrence interval of a flood of a 300 $m^3/s$. | BT-4 | Analyse |
| 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-5 | Evaluate |
| 4. | How IMD monitors agricultural droughts and explain in detail? | BT-6 | Create |

| Year | Flood m3/s | Year | Flood m3/s | Year | Flood m3/s | Year | Flood m3/s |
|---|---|---|---|---|---|---|---|
| 1955 | 375 | 1966 | 440 | 1977 | 365 | 1988 | 267 |
| 1956 | 199 | 1967 | 180 | 1978 | 270 | 1989 | 252 |
| 1957 | 232 | 1968 | 219 | 1979 | 585 | 1990 | 475 |
| 1958 | 419 | 1969 | 492 | 1980 | 435 | 1991 | 360 |
| 1959 | 245 | 1970 | 237 | 1981 | 239 | 1992 | 290 |
| 1960 | 411 | 1971 | 141 | 1982 | 264 | 1993 | 450 |
| 1961 | 166 | 1972 | 257 | 1983 | 258 | 1994 | 555 |
| 1962 | 232 | 1973 | 308 | 1984 | 198 | | |
| 1963 | 206 | 1974 | 149 | 1985 | 523 | | |
| 1964 | 233 | 1975 | 500 | 1986 | 339 | | |
| 1965 | 238 | 1976 | 540 | 1987 | 889 | | |

**UNIT IV RESERVOIRS**

Classification of reservoirs, General principles of design, site selection, spillways, elevation – area - capacity - storage estimation, sedimentation - life of reservoirs – rule curve

## 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-2 | Understand |
| 8. | What is reservoir planning? | BT-2 | Understand |
| 9. | How do you fix a capacity of reservoir? | BT-2 | Understand |
| 10. | What are the three major inputs in reservoir characterization? | BT-2 | Understand |
| 11. | What is reservoir Characterization? | BT-2 | Understand |
| 12. | What is spillway and its types? | BT-3 | Application |
| 13. | Classify the various zones of storage in a reservoir. | BT-3 | Application |
| 14. | Write down the steps for Water Resources planning. | BT-3 | Application |
| 15. | Which is uncontrolled spillway? | BT-3 | Application |
| 16. | What is reservoir capacity? | BT-4 | Analyse |
| 17. | Enumerate the factors to be considered in selection of site for reservoir. | BT-4 | Analyse |
| 18. | How the storage capacity of a reservoir is fixed? | BT-4 | Analyse |
| 19. | What are the types of flood control reservoirs? | BT-4 | Analyse |
| 20. | Compare storage and retarding reservoir | BT-5 | Evaluate |
| 21. | Why Spillway? | BT-5 | Evaluate |
| 22. | What is difference between Notch and Weir? | BT-5 | Evaluate |
| 23. | Explain the term storage capacity of the reservoir | BT-6 | Create |
| 24. | Define Flood Walls. | BT-6 | Create |
| 25. | Compare storage and retarding reservoir | BT-6 | Create |

## PART-B (13 MARKS)

| Q.No | Questions | BT Level | Competence |
|---|---|---|---|
| 1. | Explain in detail about classification of reservoirs. | BT-1 | Remember |
| 2. | Describe about reservoir sedimentation and deposition. | BT-1 | Remember |
| 3. | Write short note on single and multipurpose reservoir with its advantages and disadvantages. | BT-1 | Remember |

| | | | |
|---|---|---|---|
| 4. | Define storage capacity of the reservoir. List out and explain various storage zones of reservoir with neat sketch? | BT-1 | Remember |
| 5. | Explain in detail about physical characteristics of reservoir. | BT-2 | Understand |
| 6. | Enumerate the different types of spillway | BT-2 | Understand |
| 7. | Outline the general principles of design in reservoir. | BT-2 | Understand |
| 8. | How will you find reservoir capacity using mass curve? | BT-2 | Understand |
| 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-5 | Evaluate |
| 14. | How sedimentation reduces the reservoir capacity? | BT-6 | Create |

**PART-C (15 MARKS)**

| Q.No | Questions | BT Level | Competence |
|---|---|---|---|
| 1. | How GIS associated in determination of site selection for a reservoir? | BT-1 | Remember |
| 2. | Is used to measure dynamic loads in dams? Suggest your comments. | BT-1 | Remember |
| 3. | Explain the planning stages adopted in site selection of reservoir. | BT-4 | Analyse |
| 4. | Illustrate in detail about the storage capacity reservoir from mass curve | BT-4 | Analyse |

## 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-2 | Understand |
| 8. | What is drawdown? | BT-2 | Understand |
| 9. | Distinguish between specific capacities of a well on the specific yield of an aquifer. | BT-2 | Understand |
| 10. | What is rainwater harvesting? | BT-2 | Understand |
| 11. | What do you understand by pumping test? | BT-2 | Understand |
| 12. | Define drawdown | BT-3 | Application |
| 13. | Write the governing equation for groundwater flow | BT-3 | Application |
| 14. | Enumerate the term " Artificial Recharge | BT-3 | Application |
| 15. | Distinguish between aquitard and aquiclude | BT-3 | Application |
| 16. | Define storage coefficient | BT-4 | Analyse |
| 17. | Write any two properties of aquifer. | BT-4 | Analyse |
| 18. | Show the equation for steady state flow | BT-4 | Analyse |
| 19. | What are the advantages of groundwater? | BT-4 | Analyse |
| 20. | Write about Vadose zone | BT-5 | Evaluate |
| 21. | List the classification of saturated formation. | BT-5 | Evaluate |
| 22. | What do you infer from recuperation test? | BT-5 | Evaluate |
| 23. | Obtain the equation for unsteady flow. | BT-6 | Create |
| 24. | Outline the need of groundwater management. | BT-6 | Create |
| 25. | Why rainwater harvesting is necessary? | BT-6 | Create |

**PART-B (13 MARKS)**

| Q.No | Questions | BT Level | Competence |
|---|---|---|---|
| 1. | Briefly elaborate on the formation constants which characterize an aquifer. | BT-1 | Remember |
| 2. | Write in detail about leaky artesian aquifer. | BT-1 | Remember |
| 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 $0.01 cm^2/s$. Estimate the co efficient of permeability and intrinsic permeability of the aquifer. | BT-1 | Remember |
| 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-1 | Remember |
| 5. | Explain the classification of saturated formation | BT-2 | Understand |

| | | | |
|---|---|---|---|
| 6. | Explain in detail about the Dupuit's theory | BT-2 | Understand |
| 7. | Describe the method of determining the aquifer parameters using the pumping test data. | BT-2 | Understand |
| 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.<br>If all other conditions remain same, find the percentage change in yield under the following cases.<br>i. The diameter of the well is 40 cm.<br>ii. The drawdown is 6m<br>iii. The permeability is 17.25 m/day. | BT-5 | Evaluate |
| 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-6 | Create |

**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-2 | Understand |
| 4. | What are purposes of and methods for artificial GW recharge (AGWR)? | BT-2 | Understand |