

# GUJARAT TECHNOLOGICAL UNIVERSITY

## BE- SEMESTER-V (NEW) EXAMINATION – WINTER 2020

**Subject Code:2150602**
**Date:01/02/2021**
**Subject Name:Hydrology & Water Resources Engineering**
**Time:10:30 AM TO 12:30 PM**
**Total Marks: 56**
**Instructions:**

1. Attempt any FOUR questions out of EIGHT questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

- |  | MARKS        |    |    |    |    |    |    |    |    |               |    |    |                    |    |    |    |    |    |    |   |   |   |   |   |  |
|--|--------------|----|----|----|----|----|----|----|----|---------------|----|----|--------------------|----|----|----|----|----|----|---|---|---|---|---|--|
| <b>Q.1</b> (a) Define : Hydrology, Flood routing, Penstocks  | <b>03</b>    |    |    |    |    |    |    |    |    |               |    |    |                    |    |    |    |    |    |    |   |   |   |   |   |  |
| (b) List out the various methods used to calculate the average depth of rainfall over a catchment and explain any one with neat sketch.  | <b>04</b>    |    |    |    |    |    |    |    |    |               |    |    |                    |    |    |    |    |    |    |   |   |   |   |   |  |
| (c) What is hydrograph? Draw a single peaked hydrograph and explain its components. What are the factors affecting the shape of the hydrograph.  | <b>07</b>    |    |    |    |    |    |    |    |    |               |    |    |                    |    |    |    |    |    |    |   |   |   |   |   |  |
| <b>Q.2</b> (a) Describe the various types of dams based on the function served.  | <b>03</b>    |    |    |    |    |    |    |    |    |               |    |    |                    |    |    |    |    |    |    |   |   |   |   |   |  |
| (b) Define the term 'Drought'. Briefly explain the types of drought.   | <b>04</b>    |    |    |    |    |    |    |    |    |               |    |    |                    |    |    |    |    |    |    |   |   |   |   |   |  |
| (c) The ordinates of 3 hrs Unit hydrograph are given below :   | <b>07</b>    |    |    |    |    |    |    |    |    |               |    |    |                    |    |    |    |    |    |    |   |   |   |   |   |  |
| <table border="1" style="margin-left: 40px;"> <tr> <td>Time in Hrs.</td> <td>0</td><td>3</td><td>6</td><td>9</td><td>12</td><td>15</td><td>16</td><td>21</td><td>24</td><td>27</td><td>30</td> </tr> <tr> <td>Ordinates (cumecs)</td> <td>0</td><td>10</td><td>25</td><td>20</td><td>16</td><td>12</td><td>9</td><td>7</td><td>5</td><td>3</td><td>0</td> </tr> </table> | Time in Hrs. | 0  | 3  | 6  | 9  | 12 | 15 | 16 | 21 | 24            | 27 | 30 | Ordinates (cumecs) | 0  | 10 | 25 | 20 | 16 | 12 | 9 | 7 | 5 | 3 | 0 |  |
| Time in Hrs.   | 0            | 3  | 6  | 9  | 12 | 15 | 16 | 21 | 24 | 27            | 30 |    |                    |    |    |    |    |    |    |   |   |   |   |   |  |
| Ordinates (cumecs)   | 0            | 10 | 25 | 20 | 16 | 12 | 9  | 7  | 5  | 3             | 0  |    |                    |    |    |    |    |    |    |   |   |   |   |   |  |
| Find the ordinates of a 6 hrs UH for the same basin analytically. Also, sketch 6 hr – Unit hydrograph. What is the peak value of discharge in 6 hr – Unit hydrograph?  |              |    |    |    |    |    |    |    |    |               |    |    |                    |    |    |    |    |    |    |   |   |   |   |   |  |
| <b>Q.3</b> (a) Briefly explain the forms of precipitation.   | <b>03</b>    |    |    |    |    |    |    |    |    |               |    |    |                    |    |    |    |    |    |    |   |   |   |   |   |  |
| (b) The average rainfall over a basin of area 50 ha during a storm was as follows :  | <b>04</b>    |    |    |    |    |    |    |    |    |               |    |    |                    |    |    |    |    |    |    |   |   |   |   |   |  |
| <table border="1" style="margin-left: 40px;"> <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> </tr> <tr> <td>Rainfall (mm)</td> <td>0</td><td>6</td><td>11</td><td>34</td><td>28</td><td>12</td><td>6</td><td>0</td> </tr> </table>   | Time (hr)    | 0  | 1  | 2  | 3  | 4  | 5  | 6  | 7  | Rainfall (mm) | 0  | 6  | 11                 | 34 | 28 | 12 | 6  | 0  |    |   |   |   |   |   |  |
| Time (hr)  | 0            | 1  | 2  | 3  | 4  | 5  | 6  | 7  |    |               |    |    |                    |    |    |    |    |    |    |   |   |   |   |   |  |
| Rainfall (mm)  | 0            | 6  | 11 | 34 | 28 | 12 | 6  | 0  |    |               |    |    |                    |    |    |    |    |    |    |   |   |   |   |   |  |
| If the volume of runoff from this storm was measured as 25000 m <sup>3</sup> , determine $\Phi$ – index for the storm.   |              |    |    |    |    |    |    |    |    |               |    |    |                    |    |    |    |    |    |    |   |   |   |   |   |  |
| (c) Explain with neat sketch storage zones of reservoir.   | <b>07</b>    |    |    |    |    |    |    |    |    |               |    |    |                    |    |    |    |    |    |    |   |   |   |   |   |  |
| <b>Q.4</b> (a) Define : Unit Hydrograph, Darcy's law, Flood  | <b>03</b>    |    |    |    |    |    |    |    |    |               |    |    |                    |    |    |    |    |    |    |   |   |   |   |   |  |
| (b) What is a spillway? List out the types of spillway and explain any one briefly.  | <b>04</b>    |    |    |    |    |    |    |    |    |               |    |    |                    |    |    |    |    |    |    |   |   |   |   |   |  |
| (c) Describe the process of the Hydrological cycle with a neat sketch.   | <b>07</b>    |    |    |    |    |    |    |    |    |               |    |    |                    |    |    |    |    |    |    |   |   |   |   |   |  |
| <b>Q.5</b> (a) Explain causes of flood.  | <b>03</b>    |    |    |    |    |    |    |    |    |               |    |    |                    |    |    |    |    |    |    |   |   |   |   |   |  |
| (b) Write a short note: Methods for Separation of Base flow.   | <b>04</b>    |    |    |    |    |    |    |    |    |               |    |    |                    |    |    |    |    |    |    |   |   |   |   |   |  |
| (c) Draw a neat sketch of 'Hydroelectric power plant'. Explain the each component briefly.   | <b>07</b>    |    |    |    |    |    |    |    |    |               |    |    |                    |    |    |    |    |    |    |   |   |   |   |   |  |

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- Q.6** (a) Define: Time of concentration, Groundwater, Runoff. **03**  
(b) Explain the pumping test to estimate the safe yield from an open well. **04**  
(c) List of the structural and non – structural approaches of controlling damage due to floods. Explain structural flood control measures. **07**
- Q.7** (a) Define: Evapo- transpiration, Precipitation, Infiltration **03**  
(b) Write down the different methods available for Flood estimation and explain any two methods. **04**  
(c) Explain Roof top rain water harvesting with neat sketch. **07**
- Q.8** (a) Enlist the different types of aquifers. Describe any one aquifer with neat sketch. **03**  
(b) What is the difference between hyetograph and hydrograph? **04**  
(c) Define the term 'Evaporation'. Explain the factors affecting evaporation. **07**

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