# B. Tech Odd Semester Examination, February, 2023

## Agricultural Engineering

(5th Semester)

Course No.: AE-502

**(Watershed Hydrology)**

*Full Marks: 50*
*Pass Marks: 25*

*Time: 2 hours*

**Note:**
1. Attempt any five questions.
2. Begin each answer in a new page.
3. Answer parts of a question at a place.
4. Assume reasonable data wherever required.
5. The figures in the right margin indicate full marks for the question.
6. All the mathematical symbols and abbreviations have their usual meanings.

1. a. Write the classifications of hydrology? Draw a proper diagram of hydrological cycle. 4

   b. Write the difference between the weather and climate (minimum 4). Write some sources from where the data of hydrology were taken. 6

2. a. What is rainfall depth? Writes the limitations of tipping bucket type rain gauge. 3

   b. Explain about float type rain gauge with a proper diagram. Write the advantages and disadvantages of float type rain gauge (4 each) 7

3. a. Explain equation for the frequency of a point rain fall and Find the probability of occurring

4 times, not occurring at all and at least once in "10" successive year for frequency of a point rainfall. 5

b. What is a Time series? Write Weibull method with an example.Write the methods for estimation of missing rainfall data. 5

4. a. Write the steps for conversion of precipitation to runoff with the help of a flowchart. 3

b. Write a brief explanation on factors affecting runoff. 7

5. a. Write the Assumption and limitation of rational method (3 each).Determine $\phi$ index, if a storm of 0.117 m generated cm runoff. Assume the duration of excess rainfall as 32400 seconds. 3+3

b. Determine the initial loss and retention capacity of watershed, if curve number of watersheds is 66.Write the rainfall-runoff correlation with the help of the equation. 2+2

6. a. Explain the components of hydrograph with the help of a diagram. What is hyetograph? 5

b. The mass curve of a given storm is given below. Determine the effective rainfall and volume of direct runoff from the watershed due to given storm, if the area of watershed is 47 km². Assume the o-index of the watershed as 0.001027 mm/sec.

| Time of start of storm h | 0 | 4 | 8 | 12 | 16 | 20 | 24 | 28 | 32 |
|---|---|---|---|---|---|---|---|---|---|
| Accumulated Rainfall(cm) | 0 | 0.7 | 4.7 | 5.6 | 6.7 | 9.3 | 11.4 | 12.3 | 13.7 |

Assume amount of water lost in time $\Delta T$ was 1,57 cm. 5

7. a. Calculate the recession constant, if initial discharge and charge after 3 days are 7.7 and $3m^3/s$, respectively. 4

b. write the difference between the two shapes of watershed. Explain the methods of through which base flow separation is performed. 2+4

8. a. Write the application of unit hydrograph with diagram. 4

b. Define-

i) Synthetic-unit hydrograph

ii) Instantaneous unit hydrograph.

Write the use and limitations of Unit hydrograph. 4+2

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