

**B.Tech. Civil (Construction Management)**

**Term-End Examination**

00772

**December, 2016**

**ET-535(A) : ELEMENTARY HYDROLOGY**

*Time : 3 hours*

*Maximum Marks : 70*

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**Note :** Attempt any *five* questions. All questions carry equal marks. Use of scientific calculator is permitted. Assume any data, if needed.

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1. (a) Define Hydrology. Draw a block representation of a hydrologic system and explain the different hydrologic processes. 10
- (b) Discuss the differential heating of Earth and its effects on the atmosphere. 4
2. (a) What do you understand by 'water equivalent' of a given depth of snow ? Explain the utility of radar and satellite in the measurement of precipitation. 7
- (b) What is the usefulness of various methods of computing the average depth of rainfall over a given area ? 7

3. (a) What are the various types of Evaporimeters ? Explain any one of them with a neat sketch. 10
- (b) Calculate by energy balance method, the evaporation rate from an open water surface, if the net radiation is  $200 \text{ W/m}^2$  and the temperature is  $25^\circ\text{C}$ , assuming no sensible heat flux or ground flux. 4
4. (a) What are the factors affecting evapotranspiration and what are the field methods to measure actual evapotranspiration ? 8
- (b) Distinguish between the terms potential evapotranspiration and actual evapotranspiration. Explain the relation between the two. 6
5. (a) Bring out the difference between depression storage and surface detention. Relate the rate of depression storage to the rate of rainfall and the rate of infiltration. 7
- (b) What is the importance of infiltration in hydrologic cycle ? Discuss the practical importance of  $\phi$ -index. 7

6. (a) The observed values of run-off, at a stream gauging site are given below :

Upstream of the gauging site, a weir, built across the stream, diverts 3.0 and 0.5 million  $\text{m}^3$  ( $\text{Mm}^3$ ) of water per month for use in irrigation and industry, respectively. The return flows from irrigation estimated at 0.8  $\text{Mm}^3$  per month and from the industry at 0.3  $\text{Mm}^3$  per month, join the stream at the upstream of the gauging site. Estimate the virgin flow of the river. If the catchment area is  $120 \text{ km}^2$  and the average annual rainfall is 185 cm, also determine the run-off – rainfall ratios. 10

| <i>Month</i> | <i>Run-off (<math>\text{Mm}^3</math>)</i> |
|--------------|-------------------------------------------|
| 1            | 2.0                                       |
| 2            | 1.5                                       |
| 3            | 0.8                                       |
| 4            | 0.6                                       |
| 5            | 2.0                                       |
| 6            | 8.0                                       |
| 7            | 18.0                                      |
| 8            | 22.0                                      |
| 9            | 14.0                                      |
| 10           | 9.0                                       |
| 11           | 7.0                                       |
| 12           | 3.0                                       |

(b) What is the main difficulty in using the slope-area method of discharge measurement ? 4

7. (a) What is Unit Hydrograph ? Explain about the derivation of Unit Hydrograph. 7

(b) What are the direct methods of discharge measurement in a stream channel ? 7

8. Write short notes on any *four* of the following :  $4 \times 3 \frac{1}{2} = 14$

(a) Run-off

(b) Double Mass Curve

(c) Synthetic Unit Hydrograph

(d) Recording Rain Gauges

(e) Non-recording Rain Gauges

(f) Infiltration Indices

(g) Energy Balance

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