

**B.Tech. Civil (Water Resources
Engineering)**

Term-End Examination

June, 2008

ET-532(A) : HYDROLOGY

Time : 3 hours

Maximum Marks : 70

Note : *Solve any five questions. Each question carries equal marks. Give neat, labelled sketches in support of your answers. Use of calculator is allowed. Assume the missing data suitably.*

1. (a) What do you understand by precipitable water ? Explain as to how would you estimate it for an area. What is the importance of atmospheric pressure records ? 7
- (b) How will you estimate missing precipitation data at a given rain-gauge station ? What is the usefulness of various methods of computing the average depth of rainfall over a given area ? 7

2. (a) Enumerate the factors affecting evaporation. A reservoir with a surface area of 250 hectares had the following average values of parameters during a given week :

Water temperature = 20° C, relative humidity = 40%, and wind velocity at 1.0 m above the ground = 16 km/h. Estimate the average daily evaporation from the reservoir and the total volume of water evaporated during that one week. 3+7=10

- (b) Find the relation between rate of depression storage to the rate of rainfall and rate of infiltration. 4

3. (a) Enumerate the factors influencing run-off from a catchment area. What do you mean by seasonal and annual run-off ? 7

- (b) How are the water depths, which are more than the height of one staff gauge, measured in a natural stream ? Why is a counter-weight used in float-tape gauge ? 7

4. (a) Following are the ordinates of a storm hydrograph of a river, draining a catchment area of 423 km^2 due to a 6-h isolated storm. Derive the ordinates of a 6-h unit hydrograph for the catchment :

10

Time from start of storm (h)	Discharge (m^3/s)	Time from start of storm (h)	Discharge (m^3/s)
- 6	10	54	39.0
0	10	60	31.5
6	30	66	26.0
12	87.5	72	21.5
18	111.5	78	17.5
24	102.5	84	15.0
30	85.0	90	12.5
36	71.0	96	12.0
42	50.0	102	12.0
48	47.5	108	12.0

- (b) Differentiate between inflow and outflow hydrographs. Define flood routing.

4

5. (a) Derive expressions for steady flow in confined and unconfined aquifers.

7

- (b) Estimate the peak flood for a return period of 25 years for a 50 hectare watershed near Bhopal in medium black soil (clay) having 25, 15 and 10 hectare under cultivation, forest and grassland, respectively. The watershed has an average slope of 2.5%. The maximum length of run is approximately 2500 m, and the elevations of the most remote point in the watershed and the outlet point are 250 m and 200 m, respectively.

7

6. (a) Present in the form of a chart the different methods of flood forecasting.

4

- (b) Determine 10-year peak flow over a drainage area of 3 ha with the length of water course as 1.0 km and slope 0.5%, from the following data :

10

(Take $c = 0.8$)

Duration (min.)	10	20	30	40	50
Rainfall intensity (cm/hour)	5.5	4.1	3.3	2.75	2.3

7. (a) Discuss the drought scenario in India. Enumerate the drought relief programmes to mitigate its impact on the poor farmers.

7

- (b) Write short notes on any two of the following :

$$2 \times 3 \frac{1}{2} = 7$$

- Dupuit's theory (well hydraulics)
- Synthetic unit hydrograph
- Potential evapo-transpiration