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

**Term-End Examination**

**June, 2010**

**ET-532(A) : HYDROLOGY**

*Time : 3 hours*

*Maximum Marks : 70*

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

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1. (a) Explain the importance of temperature and pressure variations in different layers of atmosphere. What are different forms of clouds ? 4+4=8
- (b) Explain the relative advantages of various methods of computing the average depth of rainfall over a given area. 6
2. (a) Calculate the potential evapo-transpiration for an area, near New-Delhi, in the month of November by Penman's Formula. The following data are available : 7  
Latitude : 28°4' N  
Elevation : 230 m MSL  
Mean Monthly Temperature : 19°C

Mean observed sun-shine : 9 hours

Wind velocity at 2 m height  
above the ground : 85 km/h

Nature of surface cover : Close ground  
green-crop

(Given :

- (i) Saturation vapour pressure = 16.52 mm  
of Hg
  - (ii) Slope of saturation vapour pressure vs  
Temperature curve at mean air  
temperature = 1.01 mm/°C
  - (iii) Mean monthly solar radiation at top  
of atmosphere = 9.5 mm of evaporable  
water per day
  - (iv) Mean monthly possible sunshine  
hours = 10.716 h
- (b) Why is interception loss generally neglected 7  
in the studies of major storm events and  
floods ? What are different factors affecting  
Interception loss from vegetation?
3. (a) Explain with suitable sketch, the different 7  
types of routes that followed by run-off  
generated in a basin. List the difference  
between direct run-off and base flow.
- (b) In a 15 m wide rectangular channel, the 7  
depth of flow and cross-sectional areas are  
measured as 3.5 m, 52.5 m<sup>2</sup> and 3.4 m,  
51.0 m<sup>2</sup> at two sections 250 m apart. The  
drop in the water surface elevation between  
two sections was 0.11 m. Assume  
Manning's coefficient to be 0.015 and  
estimate the discharge through the channel.

4. (a) Underlying the assumptions made, define the unit hydrograph and explain its applications in hydrology. 7
- (b) The time to maximum discharge of a smoothly rising hydrograph is 5 hours. Determine the maximum time interval that can be used for routing purpose. 7
5. (a) Determine the storage coefficient of a confined sandy stratum that is 37 m thick having an average porosity of 32%. Take  $\gamma_w = 1000 \text{ kg/m}^3$ ;  $E_w = 2.14 \times 10^8 \text{ kg/m}^2$  and  $E_s = 3.05 \times 10^7 \text{ kg/cm}^2$ . 4
- (b) Derive the Thiem Equation for steady flow in a confined aquifer. 10
6. (a) 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 1.5%. The maximum length of run is approximately 2500 m, and the elevations of the most remote point in the watershed and the outlet point is 250 m and 200 m respectively. Make suitable assumptions : 7
- (b) What are the main objectives of flood forecasting and flood warning ? Discuss their advantages. 7

7. Write short notes on *any four* of the following :

- (a) Flood control in India **4x3½=14**
  - (b) Evapotranspiration
  - (c) Frequency analysis
  - (d) Probability distributions
  - (e) Catchment models
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