Roll No. ..... Total Pages : 06

BT-5/D-14 **8531**

HYDROLOGY

CE-305-E

Time : Three Hours] [Maximum Marks : 100

Note : Attempt *Five* questions in all, selecting at least *one* question from each Unit.

Unit I

1. (a) What is the significance and scope of hydrology in planning and managing the water resources of a region ? 5

(b) A catchment has six raingauge stations. In a year, the annual rainfall recorded by the gauges are as follows :

Station	Rainfall (cm)
A	165.2
B	205.8
C	360.6
D	220.6
E	197.6
F	273.4

For a 10% error in the estimation of the mean rainfall, calculate the optimum number of stations in the catchment. 5

(c) What are the methods employed for computing the average precipitation over an area ? Discuss the relative merits and demerits of various methods. 10

2. (a) Explain the following relationships as applicable to precipitation over a basin : 10

(i) Depth–Area relationship

(ii) Maximum depth–area–duration curves

(iii) Intensity–Duration–Frequency relationship

(b) What is a Raingauge ? Enumerate and differentiate between recording and non-recording type of raingauges. Sketch and expalin the non-recording type of rainguage used in India. 10

http://www.kuonline.in

http://www.kuonline.in

Unit II

3. (a) What are the factors that affect the rate of evaporation from a water body ? Explain the process of evaporation. **10**

   (b) How can the evapo-transpiration be measured from a given vegetation type ? List the various data that are needed to use Penman's equation for estimating the evapo-transpiration from a given area. **10**

4. (a) Explain and distinguish between the following : **8**

   (i) ϕ-index and W-index

   (ii) Infiltration rate and Infiltration capacity.

   (b) A seven hour storm over a basin of 1830 km^2 produced the rainfall intensities at half an hour interval are 4, 9, 20, 18, 13, 11, 12, 2, 8, 16, 17, 13, 6 and 1 mm/hour. If the corresponding observation runoff is 73.2×10^6 m^3, estimate the phi-index of the storm. **12**

Unit III

5. (a) What are the methods for estimating the run-off volume of a catchment ? Explain clearly the rainfall-runoff correlation method. **5**

   (b) For a house of area 160 sq m., 100 sq m. is builtup and the remaining portion is grassy. Runoff coefficient for the builtup area and grassy patch is 0.9 and 0.3 respectively. Average annual rainfall for the region is 1000 mm. Calculate the volume of runoff from the house. http://www.kuonline.in **5**

   (c) What are the different methods of measurement of discharge in a river ? Explain the estimation of flood discharge by Slope-Area method. What are the factors to be borne in mind for selecting the appropriate reach for this method ? **10**

6. (a) What do you understand by a Synthetic Unit Hydrograph (SUH) ? With the help of a sketch show and explain the elements of a SUH. **10**

(b) Given the ordinates of a 4-h unit hydrograph as below derive the ordinates of a 12-h unit hydrograph for the same catchment :

Time (h)	Ordinates of 4-h UH
0	0
4	20
8	80
12	130
16	150
20	130
24	90
28	52
32	27
36	15
40	5
44	0

Calculate the one-hour unit hydrograph. **10**

Unit IV

7. (a) Explain the following parameters of an aquifer : **6**

(i) Porosity.

(ii) Coefficient of Transmissibility

(iii) Storage Coefficient.

http://www.kuonline.in

(b) State and explain Darcy's law along with its range of application. **4**

(c) Develop an equation relating the steady state discharge from a well in an unconfined aquifer and depths of water table at two known positions from the well. State clearly all the assumptions involved in your derivation. **10**

8. (a) What do you understand by permeability of an aquifer ? What are the methods of determining the permeability ? Explain any *one* such method. **10**

(b) Discharge from a 40 cm diameter well fully penetrating an unconfined aquifer of 50 m thickness under a depression head of 4 m is 2500 litre/min. Find the discharge of the well under a drawdown of 6 m. Radius of influence may be taken as 320 m. **10**

http://www.kuonline.in