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**Question Paper Code : 51213**

**B.E./B.Tech. DEGREE EXAMINATION, MAY/JUNE 2016**

**Sixth Semester**

**Civil Engineering**

**CE 2021/CE 601/10111 CEE 11 – HYDROLOGY**

**(Regulations 2008/2010)**

**(Common to PTCE 2021 – Hydrology for B.E. (Part-Time) Fifth Semester, Civil Engineering – Regulations 2009)**

**Time : Three Hours**

**Maximum : 100 Marks**

**(Referring Gumbel's Distribution Table may be permitted)**

**Answer ALL questions.**

**PART – A (10 × 2 = 20 Marks)**

1. List the transportation and storage components in the hydrological cycle.
2. A Catchment has six rain gauge stations. In a year, the annual rainfall recorded by the gauges is as follows. Determine the standard error in the estimation of mean rainfall in the existing set of rain gauges.  

Station :	A	B	C	D	E	F
Rainfall (cm) :	82.6	102.9	180.3	110.3	98.8	136.7
3. What are the factors that influence the rate of evapotranspiration ?
4. Differentiate between W-index and  $\Phi$ -index.
5. How do you determine time of concentration ?
6. What are the uses of Synthetic unit hydrograph ?
7. Write the types of flood routing.
8. Distinguish between MPF and design flood.

9. What is transmissibility ?
10. Enlist the assumptions made by Dupuit.

**PART – B (5 × 16 = 80 Marks)**

11. (a) (i) The normal annual rainfall at stations A, B, C and D in a basin are 80.97, 67.59, 76.28 and 92.01 cm respectively. In the year 1985, the station D was inoperative and the stations A B and C recorded annual precipitation of 91.11, 72.23 and 79.89 cm respectively. Estimate the rainfall at station D in that year. (4)
- (ii) In catchment, whose shape can be approximated by a pentagon, four rain gauge stations are situated inside the catchment. The coordinates of the corners of the catchment that define its boundaries and the coordinates of the four rain gauge stations are given below. Also given are the annual rainfall recorded by the four stations in the year 2005. Determine the average annual rainfall over the catchment in that year by the Thiessen mean method. (12)

Distances are in km		Corner a is the origin of co-ordinates				
Catchment boundary	Corner Co-ordinates	Corner a (0, 0)	Corner b (120, 0)	Corner c (120, 80)	Corner d (60, 140)	Corner e (0, 80)
Rain gauge station	Station	P	Q	R	S	
	Co-ordinates	(40, 50)	(80, 20)	(80, 60)	(40, 80)	
	Annual rainfall (cm)	120	110	100	125	

**OR**

- (b) (i) Explain Elaborately about the distribution of fresh water resources in the world. (8)
- (ii) Describe the hydrological cycle. Explain the humankind's interference in various parts of this cycle. (8)

12. (a) (i) Explain with neat sketch the various methods of estimation of evaporations from surfaces of water bodies. (8)
- (ii) A reservoir with average surface spread of  $4.8 \text{ km}^2$  in the first week of November has the water surface temperature of  $30 \text{ }^\circ\text{C}$  and relative humidity of 40%. Wind velocity measured at 3.0 m above the ground is 18 km/h. The mean barometer reading is 760 mm of Hg. Calculate the average evaporation loss from the reservoir in mm/day and the total depth and volume of evaporation loss in the first Week of November. Use both Meyer's equation as well as Rohwer's equation. Take saturation vapour pressure at  $30 \text{ }^\circ\text{C}$  as 31.81 mm of Hg. (8)

**OR**

- (b) The following observations were taken from a double tube infiltrometer with inside ring diameter of 30 cm. Plot the infiltration capacity curve and find the constant rate of infiltration. Also, compute the average infiltration rate for the first 10 and first 30 minutes. (16)

Time (min.)	0	2	5	1	20	30	45
Cumulative volume ( $\text{cm}^3$ )	0	200	470	840	1405	1840	2245
Time (min.)	60	80	100	120	150	180	
Cumulative volume ( $\text{cm}^3$ )	2510	2745	2885	2990	3130	3270	

13. (a) (i) The ordinates of a 4h U.H. of a basin of area  $300 \text{ km}^2$  measured at 1 h intervals are  
6, 36, 66, 91, 106, 93, 79, 68, 58, 49, 41, 34, 27, 23, 17, 13, 9, 6, 3 and  $1.5 \text{ m}^3/\text{s}$  respectively. Obtain the ordinates of a 3 h U H for the basin using the S-curve technique.
- (ii) A drainage basin of area  $530 \text{ km}^2$  has experienced a 12 h storm with rainfall intensities of 2.5, 1.8, 2.3 cm/h respectively in successive periods of 4 h each. The percentages of the distribution graph of storms of 4 h duration are 5, 15, 30, 20, 13, 9, 5.5 and 2.5. Determine the ordinates of discharge hydrograph.

Assume an average  $\phi$  index of 0.8 cm/h and neglect base flow.

**OR**

(b) What is a dimensionless unit hydrograph ? How is it useful in constructing a synthetic unit hydrograph of the basin ?

14. (a) Explain briefly about various structural and Non-structural Flood control measures.

**OR**

(b) (i) How do you determine the magnitude of flood of specific return period ? (6)

(ii) Route the flood hydrograph given below through a channel reach and derive the outflow hydrograph. The values of  $K$  and  $x$  for the reach may be taken as 4 hr and 0.25 respectively. Time is in hours and inflow is in cumecs. (10)

<b>Time :</b>	0	1	2	3	4	5	6	7	8	9	10	11	12
<b>Inflow :</b>	10	20	40	80	120	150	120	60	50	40	30	20	10

15. (a) A sandy layer 10 m thick overlies an impervious stratum. The water table is in the sandy layer at a depth of 1.5 m below the ground surface. Water is pumped out from a well at the rate of 100 lps and draw down of the water table at radial distances of 3.0 m and 25 m is 3.0 m and 0.5 m respectively. Determine the coefficient of permeability of an aquifer. (16)

**OR**

(b) Derive an equation to determine the steady state discharge of a confined aquifer. (16)