Cat. No: Lwre.2104.   Marks: 50.00

Title: Watershed Hydrology(2+1)   Time: 2 hours

I State True/False   (10x1=10)

1. Orographic precipitation occurs due to air masses being lifted to higher altitudes by the presence of mountain barriers.
2. An isohyet is a line joining points having equal height above the MSL.
3. The dilution method of stream gauging is ideally suited for measuring discharges in steady flow in a small turbulent stream.
4. Direct runoff is made up of overland flow only.
5. An ephemeral stream does not have any base flow contribution.
6. The flow-mass curve is an integral curve of the hydrograph.
7. The average annual rainfall over the whole of India is estimated as 1190 cm.
8. A Lysimeter is an instrument to measure the evapotranspiration.
9. A precipitation in the form of water droplets of size less than 0.5 mm and intensity less than 1mm/h is known as rain.
10. In a given storm the average depth of rainfall decreases exponentially with the area.

II Write short notes/answers on any FIVE of the following   (5x2=10)

1. Hydrological cycle
2. Depth-area-duration curve
3. Stream gauging
4. Differentiate Hyetograph and Hydrograph
5. What is base flow? How it is separated from total runoff hydrograph?
6. A catchment is equipped with 5 rain gauges. During rainy season, the magnitudes of rainfall measured by these gauges are 25,35,45,10 and 75 cm respectively. Calculate the mean areal rainfall by using Arithmetic mean method.
7. Differentiate between time to peak and time of concentration.

III Write short answers on any FIVE   (5x4=20)

1. Write in detail about the empirical formulae to estimate the maximum possible runoff.
2. Determine the optimum number of rain gauge station required to install in the watershed of 500 sq km area, if the normal annual rainfall of different stations of watersheds are as

Station	A	B	C	D	E	F
Annual rainfall(cm)	800	1040	750	450	650	350

(Assume the allowable error as 10%)

3. How flood frequency analysis is made by using the weibull's plotting position method?
4. Explain the methods used to derive different durations of unit hydrograph.
5. Explain a procedure for checking the rainfall data for consistency and also finding the missing data.
6. Explain elaborately the different types of rain gauges used to measure the rainfall.
7. Explain the methods of estimation of average rainfall over a watershed area.

IV Write essay on any ONE

(1x10=10)

1 Calculate the runoff for 50 years recurrence interval from a watershed of AMC-III condition, if the total area of the watershed is 50 ha in which 40 ha land is under row crop on terraced land and remaining 10 ha land is under poor grass cover. Assume the maximum rainfall depth as 15 cm, occurred in 6-h duration at 50 years recurrence interval. (Hydrological soil group is 'C', curve number for row crop is 80 & for Pasture land is 86. Correction factor for AMC III is 1.14)

2 a. Explain the various infiltration equations.

b. For a small catchment, the infiltration rate at the beginning of rain was observed to be 90 mm/hr and decreased exponentially to a constant rate of 8mm/hr after 2.5 hours. Accumulated infiltration for the period was 50 mm. develop the Horton's equation for the infiltration rate at any time $t > 2.5$ hours.

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