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B.Tech Even Semester (CBCS) Exam., May—2018

AGRICULTURAL ENGINEERING

(4th Semester)

Course No. : AECC–14

(Watershed Hydrology)

Full Marks : 50
Pass Marks : 15

Time : 2 hours

Note : 1. Answer *any* **five** questions.

2. Begin each answer in a new page.

3. Answer parts of a question at a place.

4. Assume reasonable data, wherever required.

5. The figures in the right margin indicate full marks for the questions.

1. *(a)* State at least five forms of precipitations. 5

(b) Explain various methods of rainfall measurement. 5

2. *(a)* Explain different methods of estimating the missing rainfall data. 5

(b) Precipitation station *X* was inoperative for part of a month during which a storm occurred. The respective storm totals at three surrounding stations *A*, *B* and *C* were 107 mm, 89 mm and 122 mm. The normal annual precipitation amounts of stations *X*, *A*, *B* and *C* are respectively 978 mm, 1120 mm, 935 mm and 1200 mm. Estimate the storm precipitation for station *X*. 5

3. *(a)* What do you mean by adequacy of rain gauge stations of a catchment? Explain the methods of getting optimum number of stations in the catchment. 5

(b) There are four rain gauge stations existing in the catchment of a river. The average annual rainfall values at these stations are 800 mm, 620 mm, 400 mm and 540 mm respectively. Determine the optimum number of rain gauges in the catchment if it is desired to limit the error in the mean value of rainfall in the catchment to 10%. How many more gauges will then be required to be installed? 5

4. (a) Write short notes on the following : 1×5=5

(i) Rainfall frequency

(ii) Runoff

(iii) Mass curve

(iv) Infiltration

(v) Orographic precipitation

(b) Define mean areal precipitation. Describe Thiessen polygon method for its computation. 5

5. (a) Write short notes on the following : 1×4=4

(i) Hyetograph

(ii) Curve number

(iii) index

(iv) Effective rainfall

(b) Describe different methods for base-flow separation in a hydrograph. 6

6. (a) Define unit hydrograph. What is the role of unit hydrograph to predict the flood? 2+3=5

(b) Two rainfalls in magnitude of 3·5 cm and 1·75 cm have occurred consecutively at 6-h interval on a catchment area of 25 km^2. Compute

the effective rainfall amount and index, if outflow hydrograph of catchment is as follows : 5

Time of rainfall (h)	0	3	6	9	12	15	18	21	24	27
Outflow (m^3 / s)	5·5	7·5	15	21	30	25	20	5·5	5	5

(Assume base flow is constant at the rate of 5 m^3 / s)

7. (a) State the use and limitations of unit hydrograph. 3+3=6

(b) Differentiate between Synthetic unit hydrograph and Instantaneous unit hydrograph. 4

8. (a) Describe the procedure to derive the unit hydrograph from flood hydrograph. 4

(b) Derive the ordinates of 12-h unit hydrograph by *S* curve method, if ordinates of 4-h unit hydrograph is given : 6

Time (h)	0	4	8	12	16
Ordinates of 4-h *unit hydrograph* (m^3 / s)	0	20	80	130	150

Time (h)	20	24	28	32	36	40	44
Ordinates of 4-h *unit hydrograph* (m^3 / s)	130	90	52	27	15	5	0

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