B.Tech Even Semester (CBCS) Exam., April—2017

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 margin indicate full marks for the questions.

1. *(a)* What is consistency of rainfall record? Explain the procedure to test the consistency. 5

(b) Determine the ideal and acceptable number of rain gauge stations for a catchment of *(i)* mountainous catchment of temperate climate with 1500 km^2 and *(ii)* flat region of temperate climate with 1120 km^2. 5

2. Develop a 30 min SCS triangular unit hydrograph for a watershed of area 550 ha and time of concentration of 50 min. 10

3. *(a)* Define rain gauge and differentiate the recording and non-recording type rain gauge. 6

(b) Calculate the value of missing rainfall of station *X*, based on the following observation data recorded at neighbouring stations : 4

Station	*X*	*Y*	*Z*	*O*
Storm rainfall, cm	—	10·5	14·0	15·5
Normal annual rainfall, cm	105·0	120·0	150·0	155·0

4. *(a)* Define mean areal precipitation. Describe the isohyetal method for computing the mean areal precipitation of a watershed. 5

(b) Compute the value of mean areal rainfall of the following data by Thiessen polygon method : 5

Station	*A*	*B*	*C*	*D*	*E*
Rainfall, cm	10	25	35	22·5	16·2
Polygon area, km^2	175	300	100	250	150

Station	*F*	*G*	*H*	*I*
Rainfall, cm	13·5	25	30	45
Polygon area, km^2	320	400	280	450

5. *(a)* Describe the rational method of runoff computation. 4

(b) Determine the peak runoff likely to be generated from a watershed if : curve number of watershed is 70; rainfall depth due to given storm is 10 cm; area of watershed is 250 ha; maximum length and average slope of water course is 1500 m and 0·4, respectively. 6

6. *(a)* Describe and formulate the expression of direct runoff using curve number method. 5

(b) Determine the initial loss and retention capacity of a watershed if its curve number is 75. Also, find the retention capacity of paved surface of a watershed. 5

7. A catchment of 200 ha area has rainfalls of 7·5 cm, 2·0 cm and 5·0 cm in three consecutive days. The average index can be assume to be 2·5 cm/day. Distribution graph percentages of the surface runoff which extended over 6 days for every rainfall of 1 day duration are 5, 15, 40, 25, 10 and 5. Determine the ordinates of the discharge hydrographs by neglecting the base flow. 10

8. Briefly write down the following : 2½×4=10

(a) Assumptions of unit hydrograph

(b) Methods of base flow separation

(c) Synthetic unit hydrograph

(d) Instantaneous unit hydrograph

★ ★ ★