Code No: 156BF

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B. Tech III Year II Semester Examinations, August/September - 2021
HYDROLOGY AND WATER RESOURCES ENGINEERING
(Civil Engineering)

Time: 3 Hours **Max. Marks: 75**

Answer any five questions
All questions carry equal marks

1.a) Draw a neat sketch of hydrological cycle and depict on it, the distinct items relevant to Civil engineering. Explain how each item influences the formulation of water resources projects.

b) A sub basin with an area of 1038 m^2 has 7 stations. The normal annual rainfall depths for all stations are given below. Determine the optimum number of rain gauge stations to be established in the basin if it is desired to limit the error in the mean values of rainfall to 10%. Normal annual rainfalls for seven stations are 62, 94, 62, 47, 32, 88 and 70. [8+7]

2.a) What is moving average curve? How it is constructed? What are its uses?

b) A storm commenced at 7.00 hrs. The ordinates of the rainfall mass curve of this storm in mm as recorded by a recording rain gauge at 15 minutes interval 110, 112 and 112. Compute the maximum rainfall intensities for duration of 15, 30, 45, 60, 90, 120 and 180 minutes and plot the intensity – duration graph. [7+8]

3.a) Describe various methods of estimating evapotranspiration from water bodies.

b) Discuss various infiltration equations. Explain how can the constants f_c, f_0 and k in Horton's equation can be obtained from experimental data. [7+8]

4.a) Define runoff and what are the factors affecting runoff.

b) Describe SCS method of runoff computation. [8+7]

5.a) Define unity hydrograph. What are the assumptions underlying the UHG?

b) Compute and plot the ordinates of a storm hydrograph resulting from 4 hour storm with rainfall of 40 mm. The ordinates of 4 hour unit hydrograph are given below: [6+9]

Time (hrs)	3	6	9	12	15	18	21	24	3	6	9	12	15	18	21	24
UHO (cumecs)	0	115	370	505	395	315	255	240	180	135	100	70	42	25	15	0

6.a) Explain the procedure for derivation of Snyder's synthetic unit hydrograph for an ungaged catchment.

b) The ordinates of a 4 h UH of a basin of area 300 km^2 measured at 1h intervals are 6, 36, 66, 91, 106, 93, 79, 68, 58, 49, 41, 34, 27, 23, 17, 13, 9, 6, 3 and 1.5 m^3/s respectively. Obtain the ordinates of a 3 h UH for the basin using the S-curve techniques. [6+9]

7.a) Describe with the help of a diagram various forms of soil moisture. What do you understand by wilting point?

b) The transplantation of rice usually takes 16 days and Δ of water required is 60 cm on field. Due to rain, about 15 cm demand is fulfilled. Taking 12% losses from the distributary head to watercourse head and 20% losses in water courses, compute
i) Duty of water at the head of the water course.
ii) Duty of water at the head of the distributory. [7+8]

8.a) Compare Kennedy's and Lacey's theories. According to your understanding, which one is more rational and write your reasons for the same.

b) Design an irrigation canal to carry a discharge of 1.5 cumecs. Assume N = 0.02, m=1 and B/D = 5.7. [7+8]

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