Code No: 156BF **R18**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B. Tech III Year II Semester Examinations, July - 2023
HYDROLOGY AND WATER RESOURCES ENGINEERING
(Civil Engineering)

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

Note: i) Question paper consists of Part A, Part B.
ii) Part A is compulsory, which carries 25 marks. In Part A, Answer all questions.
iii) In Part B, Answer any one question from each unit. Each question carries 10 marks and may have a, b as sub questions.

PART – A
(25 Marks)

1.a) Sketch hydrological cycle and name the components of the cycle. [2]
b) Give the merits and demerits of recording and non-recording type rain gauges. [3]
c) Define evapo-transpiration and list the factors influencing it. [2]
d) Enumerate factors affecting runoff in a basin. [3]
e) What is Direct Runoff Hydrograph? Explain. [2]
f) Write a note on Baseflow separation. [3]
g) Differentiate between perched and water table aquifer. [2]
h) What do you mean by consumptive use of water? [3]
i) Write a note on canal materials and their merits. [2]
j) What do you mean by design discharge of a canal? How do you estimate it? [3]

PART – B
(50 Marks)

2.a) Explain different types of rainfall and indicate their characteristics.
b) The average annual rainfall at 4 existing rain gauges in a basin are 105, 79, 70 and 66 cm. If the average depth of rainfall over the basin is to be estimated within 10% error, determine the additional number of rain gauges required. [5+5]

OR

3.a) What do you mean by Probable Maximum Precipitation (PMP)? Explain how you estimate PMP.
b) Determine the mean areal depth of precipitation for the following data using isohyetal method. [5+5]

Zone	I	II	III	IV	V	VI
Isohyte	<6	6 - 8	8-10	10-12	>12	<8
Area Between Isohytes (cm^2)	410	900	2830	1750	720	550

4.a) Define evaporation. With neat sketch, explain measurement of evaporation using IS class A pan.
b) The rate of rainfall for successive 30 minutes period of 4 hr storm are 3.5, 6.5, 8.5, 7.8, 6.4, 4, 4, and 6 cm/hr. Assuming Φ as 4.5 cm/hr find total rainfall, total rainfall excess and W-index. [5+5]

OR

5.a) What are the different components of runoff? Explain factors affecting runoff.

b) Using the date given below, (watersheds and average curve numbers), find the runoff volume (in watershed inches) at each watershed for a rainfall event of 4.44 inches. [5+5]

Watershed ID/No	101	102	103	104
Curve number	80	72	65	90

The NRCS (SCS) curve number runoff equation (English units) is

$$Q = \frac{(P - 0.2S)^2}{P + 0.8S} \text{ where } S = \frac{1000}{CN} - 10$$

6 The direct runoff hydrograph resulting from a 4 cm of effective rainfall of 6 hr duration are given below. Determine the area of the catchment and the ordinates of the 6 hr unit hydrograph. [10]

Time (hrs)	0	6	12	18	24	30	36	42	48	54	60	66	72
Direct runoff m^3/s	0	22	172	317	357	307	227	162	102	57	27	7	0

OR

7.a) Define Unit Hydrograph. Explain the limitations and applications of Unit hydrograph.

b) With help of a sketch, explain synthetic unit hydrograph. [5+5]

8.a) A tube well 30m diameter penetrates fully into the artesian aquifer. The Stainer length is 15m. Calculate the yield of the well under 3m drawdown. The aquifer consists of sand with effective size of 2.2mm and coefficient of permeability equal to 50m/day. Assume radius of influence as 150m.

b) Explain step by step procedure for conducting recuperation test to estimate the yield of a well. [5+5]

OR

9.a) Define duty, delta and base period. Derive an expression for them.

b) The base period, intensity of irrigation and duty of various crops under a canal system are given below. Find he reservoir capacity if the canal losses are 20% and reservoir losses are 12%. [5+5]

Crop	Base Period (days)	Duty at field (ha/cumecs) D	Area under crop (ha)
Wheat	120	1800	4800
Sugarcane	360	800	5600
Rice	200	1400	2400
Vegetables	120	900	3200

10.a) Discuss the salient Regime concepts of Kennedy and Lacey's theory.

b) Design a trapezoidal channel to carry a discharge of 100 cumec at a slope of 25cm/km. The side slopes of the channel are 1.5:1, N= 0.016, B/D = 8. [5+5]

OR

11.a) Explain the causes and ill effects of water logging and salinity. Suggest preventive measures also.

b) What are canal outlets? Present a detailed classification of canal outlets. [5+5]

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