

R18

Code No: 156BF

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B. Tech III Year II Semester Examinations, January/February - 2025

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) Differentiate between evaporation and evapotranspiration. [2]
- b) What is return period? What is its importance in design of structures? [3]
- c) Define the terms ϕ index and W index. [2]
- d) Explain how you measure evaporation? [3]
- e) What is effective rainfall? What is its significance? [2]
- f) What is Base flow? How is it separated? [3]
- g) Distinguish between Specific yield and storage coefficient. [2]
- h) Define field capacity of soil. [3]
- i) Define: Water application efficiency, Water conveyance efficiency and water distribution efficiency. [2]
- j) List the ill effects of water logging. How do you control it? [3]

PART – B

(50 Marks)

- 2.a) What is hydrologic cycle? Explain the components and their importance.
- b) With help of sketch, explain the working of tipping bucket type rain gauge. [5+5]

OR

- 3.a) Explain the Thiessen Polygon Method used in rainfall analysis.
- b) The average annual rainfall of 5 rain gauges in a basin is 890, 540, 450, 410 and 550 mm respectively. How many additional gauges are required, if it is desired to limit the error to 10%. [5+5]

- 4.a) Differentiate between infiltration capacity and infiltration index. Explain how infiltration capacity is measured.
- b) A storm during dry weather has rainfall intensities of 8, 12, 40, 38, 30, 26, 28, 5, 16, 32, 36, 24, 14 and 4 mm/h at an hour intervals. What is the runoff volume from a basin area of 600 km² if the initial abstractions are 10 mm and ϕ index for the basin is 10 mm/h? What is the percent error in runoff estimate if the initial abstractions are neglected? [5+5]

OR

- 5.a) What are the various Components of Runoff. Explain the factors affecting runoff in a catchment.
- b) Describe step by step procedure for SCS-CN method of estimating runoff. [5+5]

- 6.a) Distinguish between Direct Runoff hydrograph and Unit Hydrograph. Explain how they are constructed and what data is required.
- b) The hourly ordinates of 2-hour unit hydrograph are given below. Derive a 6-hour unit hydrograph for the same catchment. [5+5]

Time in hr	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15
Discharge in cumecs	0.0	1.2	2.9	5.2	8.2	10.0	9.2	7.7	6.5	5.2	4.2	3.1	2.3	1.5	0.7	0.0

OR

- 7.a) Discuss the limitations and applications of Unit Hydrograph.
- b) Explain the concept of S hydrograph and under what circumstances you would advocate adoption of this hydrograph. Give a clear associated sketch. [5+5]
- 8.a) With help of sketches, explain salient features of different types of aquifers.
- b) A sandy layer 10m thick overlies an impervious stratum. The water table is in the sandy layer at a depth of 1.5m below the ground surface. Water is pumped out from the well at the rate of 100 lps and drawdown of the water table at radial distance of 3 m and 25m is 3m and 0.5m respectively. Find the coefficient of permeability of the aquifer. [5+5]

OR

- 9.a) What do you mean by most economical section? Explain how you arrive at the section.
- b) Details of cropping pattern of an irrigated command area are shown in the following table. Calculate the discharge required in feeding canal based on average demand of the crop water requirement. Also calculate total storage required in the reservoir. Assume 15% conveyance losses in canals and 10% evaporation loss in the reservoir. [5+5]

Crop	Season	Base period (days)	Duty at field (ha/cumec)	Crop area (ha)
Rice	Kharif	120	1600	1500
Wheat	Rabi	120	850	1700
Sugar Cane	Perennial	360	900	1100

- 10.a) Draw typical cross-section of an unlined canal for the conditions given below
- In cutting.
 - In filling.
 - In partial cutting and partial filling.
- b) Design a channel for discharge of 100 cumecs having maximum permissible velocity of 2 m/sec. The available bed slope is 1 in 2500. Assume Manning's N = 0.013 and side slope is 1.1. [5+5]

OR

- 11.a) Bring out a detailed comparison between Kennedy's and Lacey's theory of regime channels.
- b) With help of sketches, explain various components of canal outlets. Present a detailed classification. [5+5]