Code No: R2032012 **R20** SET - 1

III B. Tech II Semester Supplementary Examinations, December -2023
WATER RESOURCE ENGINEERING
(Civil Engineering)

Time: 3 hours Max. Marks: 70

Answer any **FIVE** Questions **ONE** Question from **Each unit**
All Questions Carry Equal Marks
*****

UNIT-I

1. a) Explain with neat sketches various types of irrigation. [7M]
   b) The culturable command area for a distributary is 15,000 Ha. The intensity of irrigation for Rabi (wheat) is 40% and for Kharif (rice) is 15%. If the total water requirements of the two crops are 37.5 cm and 120 cm and their periods of growth are 160 days and 140 days respectively. Determine the outlet discharge from average demand considerations. [7M]

(OR)

2. a) What is duty and delta? And also derive the relation between them. [7M]
   b) For boarder strip method of irrigation, determine the time required to irrigate strip of land of 0.04 hectares in area from tube well with a discharge of 0.02 cumecs. The infiltration capacity of the soil may be taken as 5 cm/hr and the average depth of flow on the field as 10 cm. also determine the maximum area that can be irrigated from this tube well. [7M]

UNIT-II

3. a) Explain various types of canals. [7M]
   b) Determine the economical depth of cutting for the following crosssection of canal: [7M]
   The bed width of the channel = 5 m
   Top width of the banks = 2 m
   Side slopes of excavation = 1:1
   Side slopes of the bank = 1.5:1
   Height of banks from the canal bed = 3 m throughout.

(OR)

4. a) Discuss about the design procedure of channel by Kennedy'stheory. [7M]
   b) Design a trapezoidal-shaped lined concrete channel to carry a discharge of 100 cumecs at a slope of 25 cm/km. The sideslopes of the channel are 1.5:1. The value of N may be taken as 0.016. Assume the limiting velocity as 1.5 m/sec. [7M]

UNIT-III

5. a) Explain step by step procedure you would adapt to prepare the depth-area-duration (DAD) curves for a particular storm for a basin having a number of rainguages most of which are recording. [7M]
   b) The average annual rainfall of five rainguages in a basin are 89, 54, 45, 41, and 50cm. if the error in the estimation of basin mean rainfall should not exceed 10%. How many additional gauges should be installed in the basin? [7M]

(OR)

6. a) Give a schematic diagram of hydrological cycle? [7M]

b) The rainfall data of 8 rain gauge stations located in and around the basin, shown in Fig. (B_1), are as given in the following table. [7M]

Table Cumulative rainfall in mm

Time in hours	*Gauge a*	*Gauge b*	*Gauge c*	*Gauge d*	*Gauge e*	*Gauge f*	*Gauge g*	*Gauge h*
2	*8*	*6*	*5*	*4*	*4*	*3*	*2*	*0*
4	*14*	*11*	*10*	*8*	*10*	*8*	*7*	*3*
6	*23*	*20*	*17*	*15*	*17*	*14*	*11*	*8*
8	*35*	*29*	*26*	*22*	*25*	*18*	*25*	*18*
10	*48*	*42*	*38*	*35*	*35*	*28*	*33*	*24*

The basin has an area of 5850 km^2. Obtain the depth-area-duration curves for 2, 4, and 6-hour durations.

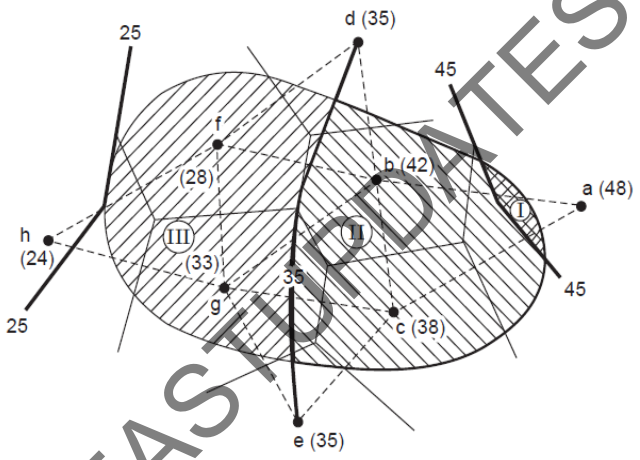

Fig. (B1) Isohyets and Theissen polygons

UNIT-IV

7. a) Explain the following terms in brief: [7M]
- Infiltration capacity
- Infiltration rate
- Infiltration indices
- W-index and Ø-index

b) The rainfall rates for successive 30-minute intervals up to 4hrs are given below. If the surface runoff is 3.6cm, determine theØ and W indices. [7M]

Time (minutes)	0	30	60	90	120	150	180	210	240
Rainfall intensity(cm/h)	0	1.3	2.8	4.1	3.9	2.8	2.0	1.8	0.9

(OR)

8. a) What is runoff? What are the factors that affect the runoff from a catchment area? [7M]

b) Horton's infiltration equation for a basin is given by $f = 6 + 16e^{-2t}$ where f is in mm/hr and t is in hours. What are the values of initial infiltration rate 'f_0', final constant infiltration rate 'f_c' and constant 'K'? if a storm occurs in this basin with an intensity of more than 22 mm/hr, determine the depth of infiltration for the 45 minutes and the average infiltration for the first 75 minutes. [7M]

UNIT-V

9. a) Discuss the step-by-step procedure to obtain the unit hydrograph. [7M]
   b) Find out the ordinates of a storm hydrograph resulting from a 3 hr storm with rainfall of 3, 4.5 and 1.5 cm during subsequent 3hr intervals. The ordinates of unit hydrographs are given in the table [7M]

Time (hr)	0	3	6	9	12	15	18	21	24	27	30	33	36
OUH (cumecs)	0	90	200	350	450	350	260	190	130	80	45	20	0

Assume an initial loss of 5mm infiltration index of 5mm/hr and base flow of 20cumecs.

(OR)

10. a) What are the factors affecting flood hydrograph? Explain [7M]
    b) In a 4 hr. storm with 50mm of excess rainfall form a basin, the flows in the steam were as follows; [7M]

Time (hr)	0	2	4	6	8	12	16	20
Flow (m^3/s)	0	1.22	4.05	6.75	5.67	3.37	1.35	0

i) Determine the ordinates of the unit hydrograph
ii) Estimate the peak flow and the time of its occurrence in a flood created by a 8hr storm , which results in 2.5cm of effective rainfall during the first 4 hrs and 3.75 cm of effective rainfall during the second 4 hrs.