U.S.N.										

B.M.S. College of Engineering, Bengaluru-560019

Autonomous Institute Affiliated to VTU

September / October 2023 Supplementary Examinations

Programme: B.E. **Semester: VI**
Branch: Civil Engineering **Duration: 3 hrs.**
Course Code: 20CV6PCIWR **Max Marks: 100**
Course: Irrigation and Water Resources **Date: 20.09.2023**

Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.
3. Draw neat sketches wherever necessary.
4. Additional normal graph sheets may be supplied.

UNIT - I

1 a) Explain the practical applications of hydrology in engineering. **04**

b) With a neat sketch explain the standard non-recording type rain gauge used in India. **06**

c) A catchment area is of the shape of a square of 4 km sides. There are 5 raingauge stations (A, B, C, D and E) in the catchment, one at each corners of the square and one at the centre, as shown in Fig.1. Annual average rainfall recorded at these stations are also marked in the figure. Calculate the average rainfall over the catchment. **10**

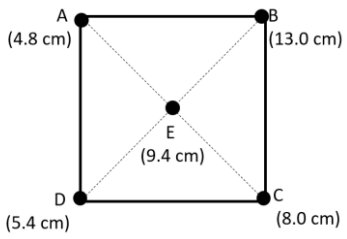

Fig.1

UNIT - II

2 a) A storm with a 15.0 cm precipitation produced a direct runoff of 8.7 cm. The time distribution of the storm is given in the table below. Estimate the Φ index of the storm. **10**

Time from the start (hr)	1	2	3	4	5	6	7	8
Incremental rainfall in each hr (cm)	0.6	1.35	2.25	3.45	2.7	2.4	1.5	0.75

b) For a catchment in India, data of monthly rainfall and runoff are given in the table below. Develop a linear relationship between rainfall and runoff. Also determine the correlation coefficient for the regression relation. **10**

Month	1	2	3	4	5	6	7	8	9
Rainfall (cm)	4	20	10	35	30	18	15	5	60
Runoff (cm)	0.2	9	3	10	8	5	4	0.5	14

OR

3 a) Define runoff. Explain the components and factors affecting runoff. **10**

b) Ordinates of the 6-hr unit hydrograph of a catchment are given in the table below. Derive the ordinates of the direct runoff hydrograph resulted from a storm of 3cm effective rainfall, lasted for 6 hours. **10**

Time (hours)	0	6	12	18	24	30	36	42	48	54	60
Discharge (m^3/sec)	0	13	40	50	42	32	21	13	8.5	5.0	0

UNIT - III

4 a) Discuss the term stream gauging, and list the various methods available for stream gauging. With a neat sketch, explain the area-velocity method of stream gauging. **10**

b) Estimate the flood discharge through a 5-m wide rectangular channel for the following data. The depth of water is 2 m and 1.8 m at two sections 500 m apart. The drop in water-surface elevation is 0.25 m. Manning's roughness coefficient is 0.025. Assume eddy loss to be zero. **10**

UNIT - IV

5 a) Explain the importance of irrigation in India. **04**

b) With a neat sketch explain the various storage zones in a reservoir and the corresponding water levels. **06**

c) With a neat sketch explain subsurface irrigation method. Also, list the advantages and drawbacks of the system. **10**

UNIT - V

6 a) Define duty of irrigation water. List the factors affecting the duty. **04**

b) The following table gives the consumptive uses and effective rainfall for the periods shown against them, for jowar crop sown at Bellary in Karnataka. The crop period is from October to January. Assume that water is not required for any purpose except that of fulfilling the evapotranspiration needs of the crop. **06**

Calculate the (i) consumptive irrigation requirement and (ii) field irrigation requirement, if water application efficiency is 70%.

Month	Consumptive use (mm)	Effective rainfall (mm)
October	37.0	30.8
November	84.2	20.4
December	154.9	6.7
January	188.1	2.4

c) Wheat is to be grown in a field having a field capacity 31% and permanent wilting point 15 %. **10**

i) Calculate the storage capacity in 80 cm depth of soil, if the dry unit weight of the soil is 14 kN/m^3.

ii) If the irrigation is to be supplied when the average soil moisture falls to 20%, estimate the water depth required to be supplied to the field.

iii) Also, determine the water needed at the canal inlet if the water lost in the water-course and the field channels is 15% of the discharge at the canal inlet.

OR

7 a) Differentiate between **04**

i) Crop period and base period

ii) Paleo irrigation and Kor watering

b) Details of the left bank canal and the right bank canal of an irrigation project are given in the table. **06**

Details	Left bank canal	Right bank canal
Gross command area (ha)	35,000	21,000
Culturable command area (ha)	20,000	12,000
Intensity of irrigation	80%	50%
Base period (days)	120	120
Discharge in the canal (cumecs)	20	8

Calculate the duty of irrigation water for these two canals and based on that comment on the efficiency of these two canal systems.

c) A stream of 130 litres per second was delivered from a canal and 100 litres per second were delivered to the field. An area of 1.6 ha was irrigated in 8 hours. The effective depth of root zone was 1.7 m. The runoff loss in the field was 420 cub.m. The depth of water penetration varied linearly from 1.7 m at the head end of the field to 1.1 m at the tail end. Available moisture holding capacity of the soil is 20 cm per metre depth of the soil. Determine the water conveyance efficiency, water application efficiency, water storage efficiency, and water distribution efficincy. Irrigation was started at a moisture extraction level of 50% of the available moisture. **10**

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