

Roll No



**PRESIDENCY UNIVERSITY
BENGALURU**

SET-B

**SCHOOL OF ENGINEERING
END TERM EXAMINATION – MAY/JUNE 2024**

Semester : Semester IV

Course Code : CIV2010

Course Name : Hydrology and Irrigation Systems

Program : B.Tech. Civil Engineering

Date : Jun 10, 2024

Time : 09.30am to 12.30pm

Max Marks : 100

Weightage : 50%

Instructions:

- (i) Read all questions carefully and answer accordingly.
- (ii) Question paper consists of 3 parts.
- (iii) Scientific and non-programmable calculator are permitted.
- (iv) Do not write any information on the question paper other than Roll Number.

PART A

Answer any four questions

4*5=20

1. Irrigation is a science of planning and designing an efficient, low-cost, economic irrigation system. Brief the objectives of Irrigation. (CO1) [Knowledge]
2. Define evaporation. Enlist the factors affecting evaporation. (CO2) [Knowledge]
3. Write the physiographic and climatic factors affecting runoff hydrograph. (CO3) [Knowledge]
4. Define hydrograph. Explain the components of hydrograph. (CO3) [Knowledge]
5. Define irrigation. Write the classification of irrigation projects in India based on culturable command area (CCA in Hectares) (CO4) [Knowledge]
6. Differentiate lined and unlined canals? (CO4) [Knowledge]
7. Define Duty, Delta and base period. Write the equation showing relationship between duty, delta and base period of a crop. (CO4) [Knowledge]
8. Enumerate the irrigation efficiency of any five surface irrigation methods. (CO4) [Knowledge]

PART B

Answer any four questions

4*10=40

9. The rainfall measured by a rain gauge is called point precipitation because it represents the rainfall pattern over a small area surrounding the rain gauge station. Identify a non recording rain gauge instrument and explain the same with neat sketch.
- (CO1) [Comprehension]
10. The water entering the soil at the ground surface after overcoming resistance to flow is called infiltration. With neat sketch explain the method of determining infiltration rate using Infiltration capacity curve (Horton curve) and ϕ - index method.
- (CO2) [Comprehension]
11. Irrigation is the engineering of controlling and harnessing the various natural sources of water, by constructing dams and reservoirs, canals and headwork's, and finally distributing the water to the agricultural fields. Discuss the merits and demerits of irrigation.
- (CO3) [Comprehension]
12. In surface irrigation technique, water flows and spreads over the surface of the land. Varied quantities of water are allowed on the fields at different times. Which are the methods of surface irrigation being suitable for close growing crops and orchards? Explain the salient features of those irrigation methods.
- (CO3) [Comprehension]
13. Water use efficiency evaluates the amount of crop yield achieved per unit of water applied. It is a measure of the productivity of water use in agriculture. Suggest the most efficient method of irrigation and discuss the same with its merits and demerits.
- (CO4) [Comprehension]
14. The spray of water is developed by the flow of water under pressure through small orifices or nozzles. The pressure created by the pump, which causes the water to flow out through the nozzle. The nozzles are mounted on the pressurized pipe system. Identify the method of irrigation and describe its advantages and disadvantages.
- (CO4) [Comprehension]

PART C

Answer any two questions

2*20=40

15. Canal irrigation is one of the types of irrigation where in the reservoir water is carried to the field through channels having specific shape and bed channel slope. The shape is generally trapezoidal or triangular with side slopes based on soil types.
- a) Depict the types of canals based on size.
- b) The left branch canal carrying a discharge of 20cumecs has culturable commanded area of 20000 hectares. The intensity of rabi crop is 80 percent, and the base period is 120 days. The right branch canal carrying a discharge of 8cumecs has culturable commanded area of 12000 hectares, intensity of irrigation of rabi crop is 50 percent, and the base period is 120 days. Compare the efficiencies of the two canal systems.
- (CO4) [Application]

16. a) Determine the frequency of irrigation from the following data.

1. Field capacity of soil = 35%
2. Permanent wilting point = 18%
3. Dry density of soil = 15 kN/m³
4. Depth of root zone = 70 cm
5. Daily consumptive use of water = 17 mm
6. Readily available moisture = 75% of the available moisture

b) A water course has a CCA of 1200 hectares. The intensity of irrigation for crop A is 40% and for crop B is 35%, both crops being Rabi crops. Crop A has a kor period of 20 days and crop B has kor period of 15 days. Calculate the discharge of the water course if the kor depth for crop A is 10 cm and for crop B is 16 cm.

(CO4) [Application]

17. Two storms each of 6-h duration and having rainfall excess values 3.0 and 2.0 cm respectively, occur successively. The 2 cm *ER* rain follows the 3 cm rain. The 6 h unit hydrograph for the catchment is given below.

Time (h)	0	3	6	9	12	15	18	24	30	36	42	48	54	60	69
UH ordinate (m ³ /s)	0	25	50	85	125	160	185	160	110	60	36	25	16	8	0

a) Calculate the resulting Direct Runoff Hydrograph (DRH).

b) Draw the graph for 2cm and 3cm DRH derived from a 6-h unit hydrograph

(CO3) [Application]

18. A tube infiltrometer has a drawback that infiltration in it does not represent or simulate the actual field conditions because the water tends to disperse laterally after coming out at the bottom.

a) Suggest the suitable infiltrometer to overcome the drawback of a tube infiltrometer. and depict the working principle of it.

b) A 3-hour storm on a small drainage basin produced rainfall intensities of 3.5 cm/hr, 4.2cm/hr and 2.9 cm/hr in successive hours. If the surface runoff due to the storm is 3cm, Find the value of ϕ -index.

(CO2) [Application]