Ref. No. Ex/CE/5/T/205/2022

BACHELOR OF ENGINEERING (CIVIL ENGINEERING) EXAMINATION 2022
(Second Year-Evening; Second Semester)

IRRIGATION ENGINEERING

Time: Three Hours

PART I

Full Marks 100
(50 marks for each part)

Use a separate Answer-Script for each part

Question No.		PART I(50 Marks)	Marks
		Answer ANY TWO questions from this PART. *Assume suitable values for the parameters if not supplied*	
1	(a)	Compare Kennedy's theory and Lacey's theory on regime channel.	5
	(b)	Draw neat sketches and discuss about the canal bed formation at different conditions of canal flow.	12
	(c)	Design an irrigation channel to carry 55 cumecs at ground slope 1 in 3000. Assume Kutter's n=0.0225 and m=0.95	8
2	(a)	Design a canal to carry a discharge of 30 cumecs having sediment load concentration 40 ppm by weight. The average grain size of the bed material is 0.25mm. Assume the cross-section of the canal is trapezoidal with side slope 0.5(H): 1(V).	12
	(b)	What is river meandering and how it differs from river bends?	3
	(c)	What are the governing variables for meander process? Explain briefly.	5
	(d)	What are the meander indices? Explain briefly.	5
3	(a)	Define the balancing depth for excavating a channel. Why the balancing depth calculation is necessary?	2+3=5
	(b)	Calculate the balancing depth for a channel section having a bed width 20 m and side slopes of 1(H):1(V) in cutting and 1.5(H):1(V) in filling. The bank embankments are kept 3.0 m higher than the ground level (berm level) and crest width of banks is kept as 2.0 m.	7
	(c)	What is the utility 'Berm' and 'Back Berm'?	7
	(d)	Define: (i) 'Causes, Effect, & Remedial Measures of Water Logging', (ii) 'True Regime, Initial Regime, & Final Regime'	3X2=6

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B. E. CIVIL ENGINEERING SECOND YEAR SECOND SEMESTER – 2022

IRRIGATION ENGINEERING

TIME: Three Hours **FULL MARKS: 100**
(Part I: 50 + Part II: 50)

Part - II (50 Marks)

Use Separate Answer scripts for each Part

1) Define the following terms: [10×1=10]
   a) Water use efficiency
   b) Effective rainfall
   c) Consumptive use of water
   d) Loam
   e) Paleo irrigation
   f) Cash crop
   g) Delta
   h) Contour farming
   i) Corrugation
   j) Khadar

2) Write short notes on the followings: [5×2=10]
   a) -Furrow irrigation
   b) Arid soil
   c) Crop season
   d) Crop rotation
   e) Field capacity

3) Answer any five questions [5× 6=30]

   a) (i) Write down the favorable conditions for the adoption of sprinkler irrigation method.
   (ii) Briefly discuss the advantages of this method. [3+3]

   b) (i) Prove that the approximate time (t) required to irrigate a land of area A is given by

$$t = 2.3\frac{y}{f}\log_{10}\frac{Q}{Q - fA}$$

   Where, Q is discharge through supply ditch, y is depth of water flowing over the border strip, f is rate of infiltration of soil.
   (ii) From the above expression calculate the area of the land that can be irrigated in 39 minutes from a tube-well with a discharge of 0.02 cumec. The infiltration capacity of soil is 5 cm/hr and the average depth of flow on the field is 10 cm. [3+3]

   c) (i) Define duty, delta and base period and establish a relationship between them.
   (ii) Discuss the factors that affects the duty. [3+3]

   d) (i) What is the importance of duty in designing an irrigation system?

(ii) How does duty differ from the head of the water-course to the head of a canal bringing water to the water-course?

(iii) A channel is to be designed for irrigating 4000 hectares in Kharif crop and 5000 hectares in Rabi crop. The water requirement for Kharif and Rabi are 50 cm and 20 cm, respectively. The base period for Kharif is 3 weeks and for Rabi, it is 4 weeks. Determine the discharge of the channel for which it is to be designed. [2+1+3]

e) (i) What is optimum moisture content? What is the difference between available moisture and readily available moisture?

(ii) After how many days will you supply water to soil in order to ensure sufficient irrigation of the given crop, if

Field capacity of soil = 28%, Permanent wilting point = 13%, Dry density of soil = 1.3 gm/c.c., Effective depth of root zone = 70 cm, Daily consumptive use of water for the given crop = 12 mm. Assume readily available moisture to be 70% of the available moisture. [3+3]

f) A stream of 130 litres/second was diverted from a canal and 100 litres/second were delivered to the field. An area of 1.6 hectares was irrigated in 8 hours. The effective depth of root zone was 1.7 m. The runoff loss in the field was 420 cubic metres. The depth of water penetration varied linearly from 1.8 m at the head of the field to 1.2 m at the tail end. Available moisture holding capacity of the soil is 20 cm per metre depth of soil. If the irrigation starts at a moisture extraction level of 40% of the available moisture, find water application efficiency, water storage efficiency and water distribution efficiency.