



Time Allotted : 3 Hours

Full Marks : 70

The Figures in the margin Indicate full marks.

Candidate are required to give their answers in their own words as far as practicable

Group-A (Very Short Answer Type Question)

1. Answer any ten of the following :

[1 x 10 = 10]

- (i) A lined canal is best designed based on _____ formula.
- (ii) Which crop can withstand high water table which normally should be 0.7m to 2.5m below the level of cropped land?
- (iii) The volume of water which can be extracted by gravity drainage from a soil stratum when expressed as percentage fraction of volume of soil stratum is called _____.
- (iv) Hydraulic jump is used for _____.
- (v) The sprinkler irrigation system is not suitable for which crop?
- (vi) Duty of irrigation water for a given crop is maximum in _____.
- (vii) The wetted perimeter of a stable channel is proportional to _____.
- (viii) The spacing of tile drains, which are provided to relieve waterlogged land, is directly proportional to _____.
- (ix) When a well penetrates a confined aquifer, water rises in the well to the level of _____.
- (x) For a given discharge in a channel the critical depth is a function of _____.
- (xi) In a hot arid district of Rajasthan state like Jodhpur the preferred mode of irrigation would be _____.
- (xii) Kor period for wheat varies from _____ to _____ weeks.

Group-B (Short Answer Type Question)

Answer any three of the following :

[5 x 3 = 15]

2. Differentiate between a) aquifer and aquiclude b) specific yield and specific retention c) flowing well and water table well. [5]
3. Classify gradually varied flow profile based on channel slope. [5]
4. Determine the time required to irrigate a strip of land of 0.1 hectares in area from a tubewell with a discharge of 0.03 cumec. The average infiltration rate is 5 cm/hr, and the average depth of flow on the field as 7.5 cm. Also determine the maximum area that can be irrigated from this tube well. [5]
5. The depth of penetrations along the length of a border strip at points 30 meters apart were probed. Their observed values are 2, 1.9, 1.8, 1.6 and 1.5 meters. Compute the water distribution efficiency. [5]
6. A wide rectangular channel has a longitudinal slope of 0.0004 and its Manning's roughness has been assessed as 0.02. Calculate the normal depth in this channel when the channel conveys a discharge intensity of $1.3 \text{ m}^3/\text{s/m}$ [5]

Group-C (Long Answer Type Question)

Answer any three of the following :

[15 x 3 = 45]

2. (a) Explain the terms water conveyance efficiency, water application efficiency, water use efficiency, water storage efficiency and water distribution efficiency. [10]
- (b) A watercourse has culturable commanded area of 2600 hectares, out of which the intensities of irrigation for perennial sugar-cane and rice crops are 20% and 40% respectively. The duty for these crops at the head of watercourse is 750 hectares/cumec and 1800 hectares/cumec respectively. Find the discharge required at the head of watercourse if the peak demand is 20% of the average requirement. [5]
8. (a) Explain the advantages of providing canal lining? What are the different types of lining? [6]
- (b) Design a triangular concrete lined channel to carry a discharge of 200 cumec, at a slope of 10cm/km. The side slopes of the channel are to be made as 1.25:1. Take n for the lining material as 0.015. [9]

9. (a) What are tile drains ? What are the advantages of tile drains? [8]
 (b) The annual rainfall in a certain area is 80 cm. Find the spacing of drains if one percent of average annual rainfall is to be drained in 24 hours. Given: depth of impervious stratum from top of soil surface = 10 metres. Position of drains is 1.8 m below top soil surface and the depth of highest position of water table below top soil surface = 1.5 m. Take permeability $k = 1 \times 10^{-4}$ m/sec. [7]
10. (a) In a field test, a time of 6 hr was required for a tracer to travel between two observation wells 63 m apart. If the difference in water table elevations in these wells are 0.42 m and porosity of the aquifer is 40%, Compute (i) the discharge velocity (ii) the coefficient of permeability (k) of the aquifer (iii) intrinsic permeability for the aquifer in Darcys, if viscosity of water $\nu = 0.01 \text{ cm}^2/\text{s}$. [6]
 (b) Explain the occurrence of flowing and non flowing artesian well. using a neat sketch. [5]
 (c) Differentiate between an artesian well and water table well. [4]
11. (a) Design the section of an unlined canal in a loamy soil to carry a discharge of 50 cumec with permissible velocity of 1m/s. Assume side slopes of 2:1 and B/D ratio as 6.0. Using Mannings formula calculate the bed slope of the canal ($N=0.0225$). <https://www.makaut.com> [9]
 (b) What are the conditions for a channel to be in true regime according to Lacey? [3]
 (c) What is meant by permanent regime? [3]

*** END OF PAPER ***

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