

Figures in the margin indicate full marks

First Half

Answer Question No. 5 and any three from the rest

1. a) Calculate the depth of each watering and interval between two successive watering for irrigating a cropped area with the following data:

Root zone depth = 1.2m, Density of dry soil = 18 KN/m³ Permanent wilting point = 11%, Field Capacity = 31%, Consumptive use of water = 11 mm/day

Assume that moisture content above PWP should not fall below 15% of the moisture between field capacity and PWP.

- b) To irrigate a plot of 2ha, water was supplied from source @ 10mVs for 10hrs and average depth of penetration of water in the irrigated area was found to be 0.8m. If conveyance efficiency is 80%, determine the efficiency of water application.
- c) Determine the efficiency of water distribution (uniformity coefficient) if after irrigation, the depths of penetration of water at six points were found as 200, 210, 220, 225, 230 and 240mm. (4+3+3=10)
2. a) A crop requires 864mm of water for base period of 120 days. Find the duty of water. Derive the formula you have used.
- b) Find the design discharge capacity of the canal assuming a time factor of 0.6 and capacity factor of 0.8 for the following crops irrigated by a canal offtaking from a reservoir. Find also the design storage capacity of the reservoir assuming no loss from storage. (3+7=10)

Crop	Base Period(days)	Area (hectares)	Duty of water at the head of the canal (hectares/cumec)
Sugercane	320	1000	530
Overlap for sugarcane in hot weather	90	170	600
Wheat (Kharif)	120	300	2000
Bajra (Kharif)	120	800	2000
Vegetables (Hot weather)	120	400	500

3. a) Design a canal to carry a discharge of 10m³/s assuming Manning's N = 0.0225, critical velocity ratio m=1.1 and B/D ratio = 3.5.
- b) Design an irrigation canal in alluvial soil to carry a discharge of 30 mVs assuming Lacey's silt factor f= 1.0. (5+5=10)
4. a) The average monthly inflows in mVs in a reservoir during a year are given in the table. If a uniform demand of 90 m³/s is desired from this reservoir, what minimum storage capacity is required?

June	July	August	Sep	Oct	Nov	Dec	Jan	Feb	Mar	April	May
20	60	200	300	200	150	100	80	60	40	30	25

- b) Derive Lacey's design equations from regime equations. (5+5=10)
5. Write short notes on any one of the following:
- i) Lacey's regime theory ii) Classification of canals (5)

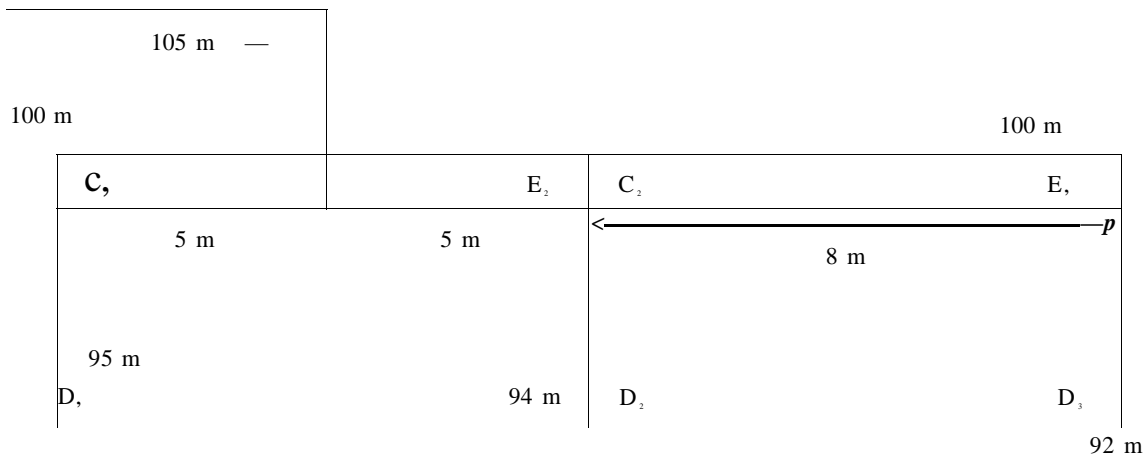
Second Half

Answer Question No. 10 and any three from the rest

6. a) Design a lined canal to carry a discharge of $150\text{m}^3/\text{s}$ assuming limiting velocity 2.0 m/s at a bed slope of 1 in 5000 and with side slopes $1:1$. Manning's N may be taken as 0.015 .
- b) An unlined canal giving a seepage loss of 4.0 cumec per million sqm. of wetted area is proposed to be lined with 12 cm thick concrete lining which costs Rs. 20.00 per sqm. Work out the economics of canal lining and show if the scheme is justified on the basis of the following data:

Annual revenue from crops = Rs. $400,000$ per cumec of water
 Discharge of the channel = 100 cumec
 Area of the channel = 50 m^2
 Wetted perimeter of the channel = 23 m
 Wetted perimeter of the lining = 22 m
 Annual maintenance cost of the unlined channel = 12 paise per m'
 Seepage lost in lined channel = 0.01 cumec per million square metre of wetted perimeter
 Saving in annual maintenance as a consequence to lining = 40%
 Life of lining = 40 years
 Rate of interest = 6%

Assume any other additional data if required. (6+4= 10)



Find the exit gradient and corrected residual uplift pressures at the key points named in the above figure assuming top level of the flood as 100m and floor thickness 1 m at the upstream and downstream end both and 2m at intersection of intermediate pile. (10)

8. a) Find the residual uplift pressures at different key points using Bligh's creep theory for the figure of Question No.7.
 b) Find the residual uplift pressures at the key points using Lane's weighted creep theory. (6+4= 10)
9. a) Draw a labeled layout plan of a diversion headwork and state the functions of each component.
 b) Discuss briefly the different modes of failures of barrages and weirs founded on permeable foundation. (6+4=10)
10. Write short notes on any one of the following:
 a) Different types of canal lining
 b) Khosla's method of independent variables (5)