

IRRIGATION ENGINEERING
(CIV3241)

Time Allotted : 2½ hrs

Full Marks : 60

Figures out of the right margin indicate full marks.

*Candidates are required to answer Group A and
any 4 (four) from Group B to E, taking one from each group.*

Candidates are required to give answer in their own words as far as practicable.

Group – A

1. Answer any twelve:

12 × 1 = 12

Choose the correct alternative for the following

- (i) Which type of irrigation system involves diversion headworks?
(a) Direct irrigation (b) Flow irrigation
(c) Innundation irrigation (d) Storage irrigation
- (ii) The total area of land that is commanded by a particular irrigation project is known as
(a) CCA (b) GCA
(c) Culturable Cultivated Area (d) Culturable Uncultivated Area
- (iii) Which type of irrigation is known as ‘feeding bottle technique’?
(a) Drip irrigation (b) Sprinkler irrigation
(c) Furrow irrigation (d) Innundation irrigation
- (iv) If rice requires about 10 cm depth of water at an average interval of about 10 days, and the crop period for rice is 120 days, find out the delta for rice.
(a) 130 cm (b) 120 cm
(c) 150 cm (d) 100 cm
- (v) Water application efficiency is defined as
(a) $\frac{W_f}{W_r} \times 100$ (b) $\frac{W_s}{W_n} \times 100$
(c) $\frac{W_u}{W_f} \times 100$ (d) $\frac{W_s}{W_r} \times 100$
- (vi) For most crops, the Kor period varies between
(a) 1 and 4 weeks (b) 2 and 4 weeks
(c) 1 and 3 weeks (d) 2 and 6 weeks
- (vii) Water is released at the rate of 12 cumec at the head of a canal. If duty at the field is 1250 hectares/cumec and loss of water in transit is 25%, find the area of the land that can be irrigated.
(a) 11250 ha (b) 112500 ha
(c) 1.125 ha (d) 11.25 ha.

- (viii) According to alignment, canals are classified as
 (a) Ridge canal, contour canal, side slope canal
 (b) Main canal, branch canal, distributary
 (c) Perennial canal, inundation canal
 (d) Lined canal, unlined canal
- (ix) The discharge of a channel, if the bed slope is 1 in 5800 and the average particle size is 0.323 mm is
 (a) 43 cumecs (b) 27.67 cumecs
 (c) 25 cumecs (d) 17.67 cumecs (ii)
- (x) Lacey gave wetted regime perimeter equation as
 (a) $P = 1.825\sqrt{Q}$ (b) $P = 2.825\sqrt{Q}$
 (c) $P = 3.825\sqrt{Q}$ (d) $P = 4.75\sqrt{Q}$

Fill in the blanks with the correct word

- (xi) The ratio between Kharif area and Rabi area in a field is _____
- (xii) Hydraulic slope is defined as the ratio of vertical drop of channel to the _____
- (xiii) The side slope of canal in alluvial soil is assumed as _____ when the canal has run for some time.
- (xiv) The canal which is aligned along a watershed (or ridge) is called a _____ canal.
- (xv) According to Lacey, "silt factor" (f) is related to mean diameter of the bed material, m as _____.

Group - B

2. (a) What is meant by 'Furrow Irrigation' and 'Sprinkler Irrigation' ? Which one is preferred in India and why?
 [(CO3)(Remember/LOCQ)]
- (b) What is meant-by 'Border flooding', and how does it differ from 'Check flooding' and 'Free flooding'?
 [(CO3)(Remember/LOCQ)]
- 6 + 6 = 12**
3. (a) Discuss critically the quality standards required for irrigation water.
 [(CO4)(Remember/LOCQ)]
- (b) Determine the time required to irrigate a strip of land of 0.04 hectares in area from a tube well with a discharge of 0.02 cumec. The infiltration capacity of the soil may be taken as 5 cm/hr and the average depth of flow on the field as 10 cm. Also determine the maximum area that can be irrigated from this tube well.
 [(CO3)(Evaluate/HOCQ)]
- 8 + 4 = 12**

Group - C

4. (a) One cumec of water is pumped into a farm distribution system. 0.8 cumec is delivered to a turn out, 0.9 kilometre from the well. Compute the conveyance efficiency.
 [(CO2,CO4)(Evaluate/HOCQ)]

- (b) 10 cumecs of water is delivered to a 32 hectare field, for 4 hours. Soil probing after the irrigation indicates that 0.3 metre of water has been stored in the root zone. Compute the water application efficiency. [[CO2,CO4](Evaluate/HOCQ)]
- (c) What are the factors on which duty depends? [[CO2,CO4](Remember/LOCQ)]
- (d) How can the duty be improved and what will be the gain? [[CO2,CO4](Remember/HOCQ)]
- (e) What is meant by flow duty and quantity duty? [[CO2,CO4](Understand/IOCQ)]
- 2 + 4 + 2 + 2 + 2 = 12**
5. (a) Define Paleo irrigation and Kor watering. [[CO2,CO4](Remember/LOCQ)]
- (b) Determine the volume of water required to be diverted from the head works to irrigate area of 5000 ha using the data given in the table below. Assuming 80% as the effective precipitation to take care of the consumptive use of the crop. Also assume 50% efficiency of water application in the field and 75% as the conveyance efficiency of canal.

Month (1)	Temp F (2)	Percentage hrs of sunshine (3)	Rainfall in mm (4)	Consumptive coefficient or crop factor(k) (5)
June	70.8	9.9	75	0.80
July	74.4	10.20	108	0.85
August	72.8	9.6	130	0.85
September	71.6	8.4	115	0.85
October	69.3	7.86	105	0.65
November	55.2	7.25	25	0.65
December	47.1	6.42	0	0.60
January	48.8	8.62	0	0.60
February	53.9	9.95	0	0.65
March	60.0	8.84	0	0.70
April	62.5	8.86	0	0.70
May	67.4	9.84	0	0.75

[[CO2,CO4](Evaluate/HOCQ)]

2 + 10 = 12

Group - D

6. (a) Classify irrigation canal based upon alignment also provide neat sketch explaining the same. [[CO3](Remember/LOCQ)]
- (b) Calculate the dimensions of the rectangular cross-section of an open channel which requires minimum area to convey 10 m³/s. The bed slope is 1 in 1500. Take the Manning's 'n' as 0.013. [[CO4](Apply/IOCQ)]
- 6 + 6 = 12**
7. (a) A channel is designed to carry a discharge of 20 m³/s with Manning's n = 0.015 and bed slope of 1 in 1000 (for trapezoidal channel side slope m = 1/√3). Find the channel dimensions of the most efficient section if the channel is (i) trapezoidal (ii) rectangular. [[CO4](Analyse/HOCQ)]

(b) What are the conditions of best economical trapezoidal channel.

[[C03](Remember/LOCQ)]

10 + 2 = 12

Group - E

8. (a) Design an irrigation channel on Kennedy's theory to carry a discharge of 45 cumecs. Take Maning's $n = 0.0225$ and $m = 1.05$, Bed slope = 1 in 5000.

[[C06](Analyse/HOCQ)]

(b) Write short note on losses in irrigation channels.

[[C06](Remember/LOCQ)]

8 + 4 = 12

9. (a) Design a channel section with following data: $Q = 30$ cumecs; $f = 1$; Side slope $S = 1/2:1$. Also find the longitudinal slope. Use Lacey's theory.

[[C06](Analyse/HOCQ)]

(b) Write in brief on maintenance of irrigation channel.

[[C05](Remember/LOCQ)]

8 + 4 = 12

Cognition Level	LOCQ	IOCQ	HOCQ
Percentage distribution	41.67	8.33	50