

Irrigation Engineering

P. Pages : 3

Time : Three Hours

**NKT/KS/17/7529**

Max. Marks : 80

- Notes :
1. All questions carry marks as indicated.
 2. Solve Question 1 OR Questions No. 2.
 3. Solve Question 3 OR Questions No. 4.
 4. Solve Question 5 OR Questions No. 6.
 5. Solve Question 7 OR Questions No. 8.
 6. Solve Question 9 OR Questions No. 10.
 7. Solve Question 11 OR Questions No. 12.
 8. Due credit will be given to neatness and adequate dimensions.
 9. Assume suitable data whenever necessary.
 10. Illustrate your answers whenever necessary with the help of neat sketches.
 11. Use of non programmable calculator is permitted.

1. a) Explain in brief the following : 6
- i) Storage irrigation.
 - ii) Drip Irrigation.
- b) Determine the depth of application and duration in days after which the water is applied to the irrigation plot from the following data : 7
- i) Root zone depth : 1.5 m
 - ii) Soil density : 1500 gm/m³
 - iii) Field capacity of soil : 25%
 - iv) Wilting coefficient : 13%
 - v) Rate of consumptive use : 15 mm/Day
 - vi) Permissible depletion of moisture : 60% of the available moisture.

OR

2. a) What is flooding method of irrigation ? In how many ways it can be accomplished ? 6
- b) Culturable command of a reservoir is 50,000 hectares. If canal losses are 5% and reservoir losses are 8%, find out the reservoir capacity based on the data given below : 7

Crop	Base period in days	Duty in hectares / cumec	Intensity of irrigation as %
Wheat	120	2000	20
Rice	140	900	15
Cotton	180	1600	10
Sugarcane	360	2500	20

3. a) Write short note on **any one**. 6
- i) Storage capacity of a reservoir using mass curve.
 - ii) Sedimentation of reservoir.

- b) A reservoir has been planned with useful life of 100 years. The storage capacity of the reservoir is 1000 millions cubic meters. The average annual yield from the basin is assessed to be $10,000 \text{ mm}^3$ and the average annual sediment flow to be 2 mm^3 . In how many years the reservoir capacity will be depleted to 50% of its present capacity due to silting ? Trap efficiencies for various capacity inflow ratios are given as below : 7

Capacity Inflow ratio	0.1	0.09	0.08	0.07	0.06	0.05
Trap efficiency (%)	86	85	84	82.5	80	78

OR

4. a) What is mass curve ? How will you determine storage capacity for the reservoir from the mass curve ? 6
- b) Explain with a neat sketch the storage levels and storage zones in a reservoir and also how these are fixed ? 7
5. a) Explain with a neat sketch the elementary and Practical profile of gravity dam. 7
- b) A gravity dam is 10 m high. It has top width of 1 m and base width 9 m. The upstream face is vertical. The water is stored upto the top of the dam. The specific weight of concrete is 24 kN/m^3 . Test the stability of this dam section against overturning. 7

OR

6. a) Explain in brief the Hydraulic and seepage failures of earthen dam. 7
- b) A homogeneous earth dam has a section as follows : 7
- i) Top width = 6 m
 - ii) U/S slope = 2.5 H : 1V
 - iii) D/S slope = 2H : 1V
 - iv) Height of dam = 20 m
 - v) Free-board = 2 m
 - vi) Filter length = 20 m
- The horizontal filter is provided on the downstream side. Draw the base parabola and the phreatic line. Also calculate the seepage per meter length of the dam if coefficient of permeability is $8 \times 10^{-4} \text{ cm/sec}$.

7. a) Explain with a neat sketch : 6
- i) Divide wall
 - ii) Silt excluder
 - iii) Fish ladder
- b) Explain in brief the design criteria of ogee spillway. 7

OR

8. a) Explain in brief the design of a weir on permeable foundation using Bligh's creep theory. 6

- b) Explain with a neat sketch vertical and radial spillway gates. 7
9. a) Explain in brief : 7
- i) Canal lining
 - ii) Kennedy's critical velocity ratio.
- b) Using Lacey's theory, design a channel section carrying full supply discharge of 15 cumec. Mean diameter of silt particles is 0.33 mm and side slopes of the channel are 0.5:1. 7

OR

10. a) Using Kennedy's theory, design a channel section carrying full supply discharge of 50 cumec. Kutter's $N = 0.0225$ and side slopes are 0.5 : 1. B/D ratio is 10.5. 7
- b) Design a trapezoidal shaped concrete lined channel to carry a discharge of 100 cumec at a slope of 1 in 4000. The side slopes of the channels are 1.5 : 1 and Manning's N may be taken as 0.016 Limiting velocity is 1.5 m/s. 7

11. Write short notes on : 13
- i) Canal falls.
 - ii) Causes of Waterlogging and it's remedies.
 - iii) Superpassage and level crossing.
 - iv) Cross regulators.

OR

12. Write short notes on **any three**. 13
- i) Aqueducts and siphon aqueducts.
 - ii) Head regulators.
 - iii) Design of tile drains.
 - iv) Canal escapes.
