

Irrigation Engineering

P. Pages : 3

Time : Three Hours



KNT/KW/16/7529

Max. Marks : 80

- Note :
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) Differentiate between : **any two**. 6
- i) Drip Irrigation and Sprinkler irrigation.
 - ii) Storage Irrigation and Flow Irrigation systems.
 - iii) Border Irrigation and Furrow Irrigation.

- b) Following table indicates the data of a off-taking canal. 7
Determine the discharge at the head of this canal by assuming 20% losses as conveyance losses.

| S.N | Crop | Base Period (days) | Water requirement of crop (cm) | Area Irrigated (ha) |
|-----|----------------------------------|--------------------|--------------------------------|---------------------|
| 1 | Sugarcane | 300 | 400 | 1000 |
| 2 | Overlap sugarcane in hot weather | 100 | 150 | 200 |
| 3 | Hot weather crop | 120 | 150 | 300 |
| 4 | Kharif crop | 120 | 55 | 800 |
| 5 | Rabi crop | 120 | 70 | 900 |

OR

2. a) Define the following: **any four**. 6
- i) duty,
 - ii) delta,
 - iii) capacity factor,
 - iv) root zone depth,
 - v) field capacity
 - vi) crop ratio.

- b) After how many days will you do irrigation in order to ensure healthy growth of crops, if: 7
- i) Field capacity of soil = 30%
 - ii) Permanent wilting percentage = 13%
 - iii) Density of soil = 13KN/m³
 - iv) Effective depth of root zone = 750 mm
 - v) Daily consumptive use of water for the given crop = 12 mm,
- For healthy growth moisture content must not fall below 25% of the water holding capacity between the field capacity and the permanent wilting point.

3. a) Write Short Notes: **any two** 6
- i) Sedimentation of a reservoir
 - ii) Reservoir storage zones and water levels.
 - iii) Criterion for Selection of site for a reservoir.

- b) The following table gives the mean monthly runoff of a river. 7

| Month | April | May | June | July | Aug | Sept | Oct | Nov | Dec | Jan | Feb | Mar |
|------------------------|-------|-----|------|------|-----|------|-----|-----|-----|-----|-----|-----|
| Runoff Mm ³ | 3 | 5 | 8 | 13 | 16 | 18 | 12 | 8 | 5 | 2 | 2.2 | 2.5 |

Draw a mass curve and find the capacity of the reservoir for the combined demand for irrigation, power generation reclamation etc. is 5 million cu. m/ min.

OR

4. a) Explain how would you determine the area-elevation and capacity-elevation curves for reservoir and their utility? 6

- b) Fix FRL, LSL, HFL and TBL of a reservoir from the following data: 7

- i) Effective storage required for crops = 3200 ha-m
- ii) Reservoir losses = 20% of effective storage.
- iii) Carry over allowance = 10% of effective storage.
- iv) Dead storage = 10% of gross storage.
- v) Flood lift = 3.2 m
- vi) Free board = 3.0 m

| | | | | | |
|----------------------------|------|------|-------|-------|-------|
| Contour RL (m) | 81 | 84 | 105 | 108 | 111 |
| Storage (Mm ³) | 3.62 | 4.25 | 44.75 | 49.26 | 59.25 |

5. a) Solve **any two**. 7

- i) Explain elementary profile of a Gravity dam.
- ii) Describe various modes of failure in Gravity Dam
- iii) Drainage Gallery & its effect on uplift pressure.

- b) A masonry dam (specific gravity = 2.25) with vertical face has top width 4 m, bottom width 20 m and height 24 m. FRL is 3 m below top. Determine the factor of safety against overturning and stresses developed at the toe and heel of the dam. 7

OR

6. a) What are the methods of seepage control in an earthen dam? Explain with the help of neat sketches. 7

- b) Flow net was prepared for a 50 m high earth dam having 2.5 m free board, No. of potential drops = 20 and no. of flow channels = 5. If the dam is provided with 45 m horizontal filter at downstream side, determine the discharge per m length of the dam. Coefficient of permeability of the dam is 2.5×10^3 cm/sec. 7

7. a) Explain the design criteria for Ogee Spillway? 6

- b) Explain Bligh's Creep theory for design of weirs on permeable foundations. 7

OR

8. a) Explain with a neat sketch, the functions of **any two**. 6
i) Divide wall
ii) Silt excluder
iii) Undersluices
- b) Distinguish between a Chute spillway and a side channel spillway. Under what circumstances are they used? 7

9. a) Design an irrigation channel in fine alluvium to convey a discharge of 30 cumec with bed slope of 1 in 5000. CVR = 0.9 and Kutter's N = 0.0225. Assume side slopes of 0.5:1. 7
- b) Using Lacey's theory, design a channel section for the following data: Discharge = $40\text{m}^3/\text{sec}$, Silt factor = 1, Side slopes = 1 V: 0.5H. 7

OR

10. a) Design a concrete-lined channel to carry a discharge of 100 cumec with a velocity not exceeding 2 m/s. Bed slope = $1/2500$, side slopes = 5/4 horizontal: 1 vertical, $n = 0.014$. 7
- b) Explain **any one** with neat sketch. 7
i) Canal lining
ii) Balanced depth of a lined canal

11. a) Write Short notes on **any one**. 6
i) Canal falls
ii) Canal regulators
- b) Write Short notes on **Any One**. 7
i) Aqueduct and Super passage
ii) Canal escapes

OR

12. a) What is waterlogging? Write the causes, effects and remedial measures of waterlogging. 6
- b) Write short notes on **any two**. 7
i) Groynes
ii) River training work
iii) Land reclamation

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