

TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
Model Question

Exam	Regular (New Course)		
Level	BE	Full Marks	60
Program	BCE	Pass Marks	24
Year/Part	III/II	Time	3hrs

Subject: Irrigation and Drainage Engineering (ENCE 354)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt **All** questions
- ✓ The figure in the margin indicates **Full Marks**
- ✓ Assume suitable data if necessary

1. a) Briefly explain about the institutional aspects that must be considered for the proper planning of irrigation? [3]

b) A canal takes off from the reservoir, data for irrigated crops are given in table below.

Crops	Base period (days)	Cropping area (hectare)	Duty (ha/cumecs)
Rice	130	2000	1000
Wheat	120	1500	1500
Sugarcane	320	1700	800
Maize	110	1200	750
Winter Vegetables	90	300	500

Compute the peak demand discharge considering canal loss of 20%, time factor of 0.75 and capacity factor of 0.85. Also calculate the gross storage of the reservoir if evaporation and seepage loss from the reservoir is of 25%, carry over storage for late monsoon as 7% and dead storage is of 10% of gross storage. [3+2]

2. a) Design the guide bank for the bridge location from the following data provided.
Discharge of the river = $30000\text{m}^3/\text{s}$, HFL = 305m, RL of river bed = 299m, afflux = 0.50m, freeboard = 0.65m and silt factor = 0.90. [4]

b) Determine the dimension of the desilting basin for the settlement of sediment particles from the canal section for considering turbulence flow condition from the following data:

Discharge of the canal = $10\text{m}^3/\text{s}$, settling velocity = 0.025m/s, depth of settling basin = 4m, size of sediment particles to be settled = 0.25mm. [4]

3. For the following data for the design of head work:

High flood discharge of river = $20000\text{m}^3/\text{s}$, Discharge concentration of 20%, Down stream bed retrogression of 0.50m, HFL before construction of structure = 405m, River bed level = 498m, Exit gradient = 1/7, Silt factor = 0.95, Pond level = 403m and at pond level flow condition, water level at d/s maintains the elevation of 402.30m.

- i) Fix the waterway length of under sluice and barrage.
- ii) Determine the depth of u/s and d/s cutoff walls and horizontal floor for the barrage portion.
- iii) Draw the conceptual figure. [2+4+2 = 8]

4. Design Sarada type vertical fall from the following data provided:
Full supply discharge of canal = $25\text{m}^3/\text{s}$, depth of flow = 1.65m, canal bed width = 15m, FSL of canal u/s = 680m, Fall of bed = 2.15m, Roughness coefficient = 0.023, Side slope of canal = 1.5:1 (H: V) and Safe exit gradient = $1/6$. [8]
5. a) What do you understand by the term justification of canal lining? Illustrate it with the clear Procedure. [1+3]
b) How the land gets ill aerated by water logging? What are the effects and preventive measures of water logging? [1+1+2]
6. For the design of cross drainage structure with the following data:
- | S.N | Corresponding | Discharge(m^3/s) | Bed level (m) | Side slope | Bed width (m) | FSL / HFL(m) | Remarks |
|-----|---------------|------------------------------------|---------------|------------------|---------------|--------------|------------|
| 1 | Canal | 35 | 603m | $1\frac{1}{2}:1$ | 15 | 604.5 | $N=0.025$ |
| 2 | River | 350 | 601m | - | - | 603.45 | $f = 0.90$ |
- a) Design TEL, FSL and BL of aqueduct structure.
b) Design the trough of aqueduct with inspection road.
c) Show the variation in width of contraction and expansion transition. [3+3+2]
7. Design data for cross regulator are as follows:
Discharge of parent canal = $50\text{m}^3/\text{s}$, Full supply level of parent canal u/s and d/s = 100.50 and 99.90m respectively, Bed level of parent canal u/s and d/s = 98.5m and 97.90m respectively. Bed width of canal u/s = 20m and d/s = 14m. Exit gradient for khosla = $1/7$ and silt factor=0.9.
Design the waterway, thickness and length of horizontal floor of cross regulator. [8]
8. Design the drainage canal for the paddy field for 10 hectares of land using water balance equation. If three days maximum annual rainfall is 400mm such that water that retains in the field should not be greater than 300mm for a single day and same can persists up to consecutive three days by greater than 200mm. [4]