

GUJARAT TECHNOLOGICAL UNIVERSITY
BE - SEMESTER-VII • EXAMINATION – SUMMER 2013

Subject Code: 170602**Date: 24-05-2013****Subject Name: Irrigation Engineering****Time: 02.30 pm - 05.00 pm****Total Marks: 70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

Q.1 (a) (i) Explain irrigation efficiency. 07

(ii) Define: water application efficiency; water storage efficiency and water use efficiency.

(b) 5 cumec of water is supplied to a field having an area of 21 hectares. It is found that 30 cm of water depth has been stored in the root zone of the crop. Determine the water application efficiency. 07

Q.2 (a) Explain the terms: (i) Crop period and Base period (ii) Duty of water. 07

(b) What is the consumptive Irrigation Requirement (CIR)? State the different factors affecting it. 07

Determine the Consumptive use and Field Irrigation requirement (FIR) for a rabi crop from the following data:

(i) Consumptive Use Coefficient (K) = 0.74

(ii) Total Pan Evaporation during the season (E_p) = 53.38 cm

(iii) Total Effective Rainfall (R_e) = 5.3 cm

Take water application efficiency $\eta_a = 80\%$. Assume other losses like leaching etc. are absent.

OR

(b) The GCA of an irrigation project is 1 lac hectares. The CCA is 75 % of GCA. The intensities of irrigation for Kharif & Rabi crops are 50 % and 55 % respectively. If the duties for Kharif & Rabi crops are 1200 hact/cumec and 1400 hact/cumec respectively, determine the discharge at the head of canal considering 25 % provision for transmission loss, overlapping allowances, evaporation etc. 07

Q.3 (a) Explain Lacey's silt theory. Using Lacey's basic regime equations derive an expression for scour depth. 07

(b) Design an alluvial canal by using Lacey's theory from the following data: 07

(i) Full supply discharge = 35 cumec.

(ii) Roughness coefficient = 0.025

(iii) Side slope = 1:1.25 and bed slope = 1/5000

(iv) Available CVR (m) = 0.9 to 1.1

(v) Standard roughness coefficient of soil (N_a) = 0.0225

OR

Q.3 (a) What do you mean by lining a canal? What are the advantages of it? 07

(b) State the stepwise procedure for designing a lined canal with triangular section when given quantities are discharge, roughness coefficient, bed slope and either side slope or θ . 07

Design a triangular shaped lined canal from the following data:

(i) Discharge = 50 cumec

- (ii) Roughness coefficient = 0.022
- (iii) Side slope = 1: 1.25
- (iv) Bed slope = 1/3000.

Q.4 (a) Explain the term 'Diversion Head Works'. State the different points favorable for its location. **07**

(b) State the causes of failure of weirs founded on permeable soils and their remedies. **07**

A weir founded on the permeable soil having Bligh's coefficient (C) = 6. Find the exit gradient for this structure and state whether it is safe against the piping or not. Consider the following data:

- (i) Head of water up to the crest of gate on u/s = 2.6 m
- (ii) Depth of d/s cutoff = 3.6 m
- (iii) length of floor = 20 m.

OR

Q.4 (a) What do you mean by water logging of soil? How would you prevent it? **07**

(b) State the following criteria for the open drain design: (i) Depth; (ii) Side slope; (iii) Bed slope and Velocity of flow in the drain. **07**

Design a drainage channel for a catchment area of 100 hect. Coefficient of runoff = 0.6 and intensity of rain fall = 35 mm/hr. Take N = 0.025. Assume side slope = 1:0.5. Use Lacey's theory for the design of above drainage channel.

Q.5 (a) Differentiate between the Aqueduct and siphon Aqueduct and mention the functions of cross regulator. **07**

(b) Explain the transition of a canal. Design a canal transition from the following data using Mitra's method: **07**

- (i) Canal bed width = 20 m
- (ii) Length of contraction transition = 10 m and that of the expansion transition = 15 m
- (iii) Splay of contraction transition = 2:1 and that of for expansion transition = 2:1.5.

OR

Q.5 Write short Notes (Any Four): **14**

- (i) Bligh's Creep theory and its limitations.
- (ii) Land reclamation.
- (iii) Sloping glacis weir.
- (iv) Canal falls.
- (v) Benefits and ill effects of irrigation.
- (vi) Drip irrigation.
