Bengal Engineering and Science University
B.E.(Civil) 6th Semester Examination, April, 2013
Sub: Irrigation and Hydraulic Structures (CE-604)

Time: Three hours | Full Marks: 70

Figures in the margin indicate full marks.

First Half

Answer Question No. 5 and any three from the rest

1. (4+6=10)

a) List suitable crops for furrow irrigation and drip irrigation.

b) Write a short note on sprinkler irrigation.

2. (4+6=10)

a) Explain i) Water application efficiency ii) Water use efficiency

b) An area of 20000 hectares has to be irrigated for rice having field delta as follows:

Month	June	July	August	September	October
Delta (mm)	200	300	400	350	200

Determine the design capacity of a canal for supplying water to the above crop assuming loss of water as 20% in conveyance.

3. (5+5=10)

a) Design an irrigation canal to carry a discharge of 15 cumec. Assume N = 0.0225 and m=1.1. The channel has a bed slope of 0.4m per kilometer and side slope of 1H:2V. Draw a sketch of the canal section.

b) Design a canal section for the following data accoding to Lacey's theory: Discharge Q = 30cumec, silt factor f=0.9, side slope = 1H:2V. Determine also the bed slope of the canal.

4. (5+5=10)

a) Derive the relationship between discharge and spacing of closed drains.

b) In a drainage system closed drains are to be placed with their centers 3 m below the ground level to keep the highest position of water table 1.8m below the ground level. The impervious stratum is at a depth of 7.5 m below the ground level. If the average annual rainfall in the area is 1000 mm, find the spacing of drains. Assume 1% of the average annual rainfall to be drained in 24 hours and co-efficient of permeability 0.00001 m/s.

5. Derive the relationship between discharge with wetted perimeter using Lacey's regime equations. (5)

Second Half

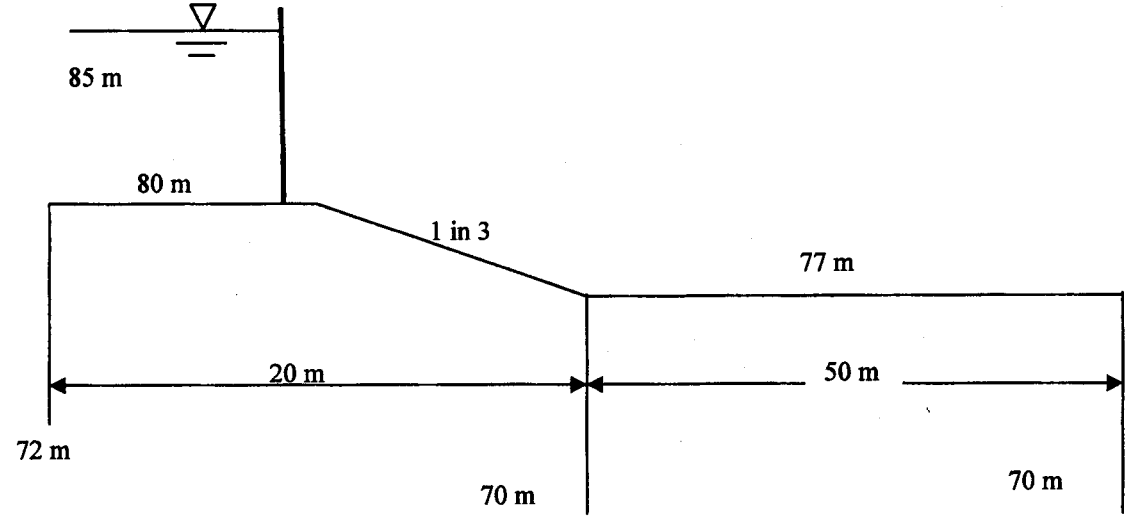
Answer Question No. 10 and any three from the rest

6. (10)

An existing unlined canal has bottom width = 1.5m, depth of flow = 0.9m, bed slope = 0.0005 and side slope = 1.5(H):1(V). It is proposed to provide lining to the canal for the same discharging capacity. Compute the dimension of the lined canal and work out the economics of the concrete lining for the following given data: Length of irrigation season = 152 days, saving in seepage = 1.4% per km, Cost of water = Rs. 145/- per ham, Cost of lining = Rs. 15 per sq m., Interest rate = 6%, Life of lining = 42 yrs, annual maintenance and operation cost of unlined canal = Rs. 1000/- per km and Rs. 200/- per km for lined canal, other annual benefits Rs. 345/-, roughness coefficient for unlined canal = 0.025. Assume additional data if required.

7. (10)

Use Khosla's theory to calculate the percentage uplift pressures at the u/s and intermediate piles for the following profile of a weir applying corrections as applicable. (Given slope correction for 1 in 3 slope is 4.5%). Assume uniform floor thickness of 2m.



8. (4+6=10)

a) Explain safety against uplift pressures for weirs founded on permeable foundation according to Bligh's theory.

b) A weir on a permeable foundation has a floor of 25m length in the direction of flow. The depths of upstream and downstream piles are 7 m and 8.5 m respectively. Using Bligh's creep theory, calculate the uplift pressures at the mid-length of the floor and at a distance of 5m from the u/s end. Also calculate the floor thicknesses required at these points. The effective head of water can be assumed to be 5m. (Take G=2.24)

9. (4+6=10)

a) Explain the steps for computing the maintainable demand if the reservoir storage capacity is known.

b) The average monthly inflow into a reservoir during a dry year is given below. If a uniform demand of 230Mm^3 per month is to be met by this reservoir, what storage capacity is required?

Month	June	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May
Monthly Inflow (Mm^3)	52	160	536	778	535	388	267	214	150	107	78	67

10. Draw a neat sketch of the diversion headwork and label its components. (5)