B.E. (Civil) 6th Semester Examination, April, 2012
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. (6+4=10)

a) Write a short note on drip irrigation. Name two crops which are suitable for drip irrigation.

b) Determine the net depth of irrigation water required to irrigate a field 1500m long and 8m wide from a source supplying water at the rate of 45000 litres per hour in a loam soil. The field capacity of soil is30%, depth of root zone is 1.2m and specific gravity of soil is 1.35 and irrigation is started when 40% of available moisture is used. Determine also the time required to irrigate the field.

2. (6+4=10)

a) A stream of 170 l/s was delivered from a canal and 120l/s were delivered to the field. An area of 3.5 hectares was irrigated in nine hours. The effective root zone depth was 1.4 m. The runoff loss in the field is 440 m^3. The depth of water penetration varied linearly from 1.7 m at the head end of the field to 1.3 m at the tail end. Available moisture holding capacity of soil is 160mm per metre depth of soil. Determine the water application efficiency, water conveyance efficiency, water storage efficiency and water distribution efficiency. Irrigation was started at a moisture extraction level of 40%.

b) Define the following:

i) Net irrigation requirement ii) Kor-watering

3. (5+5=10)

a) Design an irrigation canal to carry a discharge of 20 cumec. Assume N = 0.0225 and m=1.1. The channel has a bed slope of 0.3m per kilometer and side slope of 1H:2V.

b) Design a canal section for the following data: Discharge Q = 10cumec, silt factor f=1.0, side slope = 1H:2V. Determine also the bed slope of the canal.

4. (5+5=10)

a) Briefly explain the layout of a closed drain system.

b) In a drainage system closed drains are placed with their centres 8.5m above the impervious stratum and the maximum height of the drained water table above the centre of the drains is 0.6m. If the spacing of the drains is 25m and the drains carry 1.5% of the average annual rainfall in 24 hours, find the average annual rainfall. Take coefficient of permeability k= 5×10^{-6}m/s.

5. Using Lacey's basic regime equations derive the perimeter-discharge relationship in an unlined canal. (5)

Second Half

Answer Question No. 10 and any three from the rest

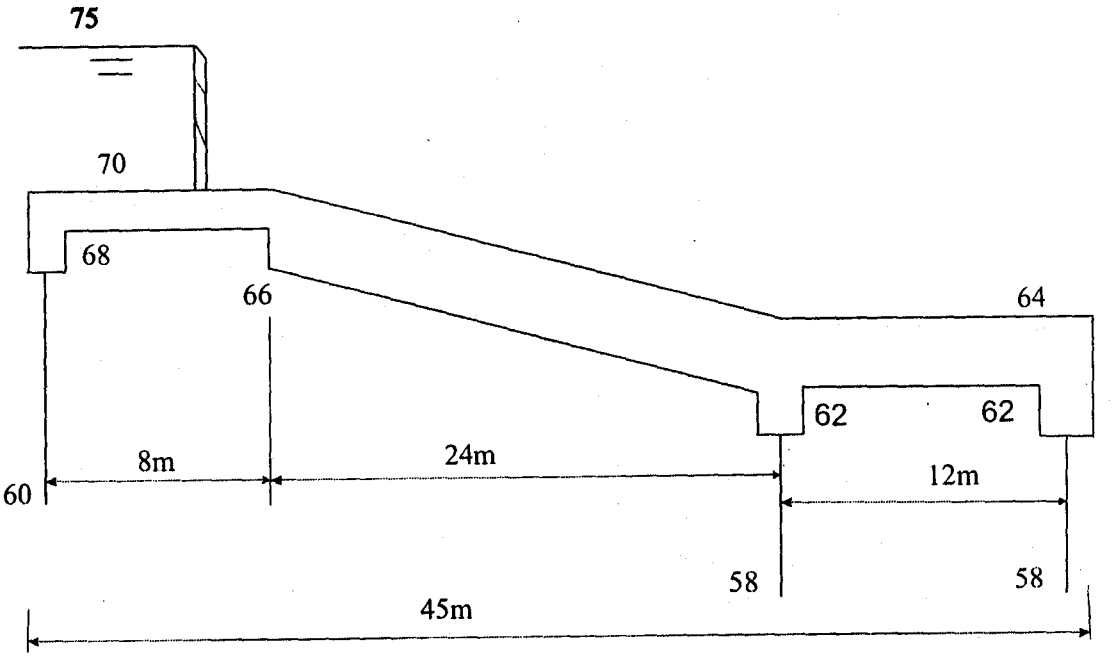
6. (6+4 = 10)

a) 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

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

7.



The profile of a weir is shown in the above figure. Find the corrected residual uplift pressures at the key points on upstream and intermediate pile using Khosla's theory. Use the table for slope correction.

Slope(V:H)	Correction(% of pressure)
1 in 4	3.3
1 in 6	2.5

8. (6+4=10)

a) A weir on a permeable foundation has a floor of 10m length in the direction of flow. At the two ends of floor 3m deep piles are provided. Using Bligh's creep theory, calculate the uplift pressures at the mid-length of the floor and at a distance of 2.5m from the u/s end. Also calculate the floor thicknesses required at these points. The effective head of water can be assumed to be 2m. (Take G=2.24)

b) Explain safety against uplift pressures according to Bilgh's theory.

9. (6+4=10)

a) Design a concrete lined canal to carry a discharge of 400 cumec at a slope of 1 in 10000. The side slopes of the canal are 1.25:1 and Manning's N may be taken as 0.014. The B/D ratio is given as 6.8.

b) Justify the economics of canal lining.

10. What is the importance of exit gradient? How would you check the exit gradient? (5)