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CE - 602

B.E. VI Semester

Examination, December 2014

Water Resources and Irrigation Engineering

Time : Three Hours

Maximum Marks : 70

Note: i) Attempt five questions. All questions carry equal marks.
ii) There is internal choice within each question.
iii) Answer should be precise and to the point only.
iv) Assume suitable data if necessary and state them clearly.

1. a) What are various types of rain gauges? Explain the working of any one in detail.

   b) A 12-hour storm rainfall with the following depths in cm occurred over a basin.

   2.0, 2.5, 7.6, 3.8, 10.6, 5.0, 7.0, 10.0, 6.4, 3.8, 1.4 and 1.1

   The surface run-off resulting from the above storm is equivalent to 25.5 cm of depth over the basin. Determine the average infiltration index for the basin.

OR

OR

10. a) What do you understand by head regulator? State functions of a distributary head regulator and a cross regulator.

    b) Explain the method of fixation of water-way of drain in an aqueduct.

2. a) What is a hydrograph? Draw a single peaked hydrograph and explain its components.

b) The ordinates of a 6-h unit hydrograph are given.

Time (h)	6-h UH ordinate (m^3/s)
0	0
3	150
6	250
9	450
12	600
18	800
24	700
30	600
36	450
42	320
48	200
54	100
60	50
66	0

A storm had three successive 6-h intervals of rainfall magnitude of 3.0, 5.0 and 4.0 cm respectively. Assuming a Ø index of 0.20 cm/h and a base flow of 30 m^3/s determine and plot the resulting hydrograph of flow.

3. a) Distinguish between the following:
   i) Aquifer and aquitard
   ii) Unconfined aquifer and a leaky aquifer

b) A gravity well has a diameter of 60 cm. The depth of water in the well is 40 metres before pumping is started. When pumping is being done at the rate of 2000 litres per minute, the drawdown in a well 10 metres away in 4 metres and in another well 20 metres away is 2 metres. Determine
   i) Radius of zero drawdown
   ii) Coefficient of permeability
   iii) Drawdown in the well
   iv) Specific capacity of the well
   v) Maximum rate at which water can be pumped from the well

OR

4. a) Define flood frequency and return period. Explain the methods of flood frequency analysis.

b) Route the following flood through a reach for which K = 22 h and x = 0.25. Plot the inflow and outflow hydrographs and determine the peak lag and attenuation. At t = 0 the outflow discharge is 40 m^3/s.

Time (h)	Inflow (m^3/s)
0	40
12	65
24	165
36	250
48	240
60	205
72	170
84	130

96	115
108	85
120	70
132	60
144	54

5. a) Describe briefly the various steps involved in planning water resources projects.

   b) What do you mean by linear programming problem? How is this method useful in water resources projects.

OR

6. a) Describe the role of water in environment.

   b) Describe the impact assessment of water resources development.

7. a) Define the following

   GCA, CCA, Kor depth, Kor period, Outlet factor, Capacity factor, nominal duty, open discharge, rabi and kharif crops.

   b) A water course command an irrigated area of 800 hectares. The intensity of irrigation of rice in this area is 50%. The transplantation of rice crop takes 15 days and total depth of water required by the crop is 60 cm on the field during the transplantation period, given that the rain falling on the field during this period is 15 cm. Find the duty of irrigation water for the crop on the field during transplantation, at the head of the distributory, assuming losses of water to be 20% in the water course. Also calculate the discharge required in the water course.

OR

8. a) What do you understand by the following terms crop ratio, overlap allowance, Capacity factor and full supply coefficient.

   b) The base period, intensity of irrigation and duty of various crops under a canal system are given in the table below. Find the reservoir capacity if the canal losses are 20% and reservoir losses are 12%.

Crop	Base period (days)	Duty at the field (hectares/cumec)	Area under the crop (hectares)
Wheat	120	1800	4800
Sugar-cane	360	800	5600
Cotton	200	1400	2400
Rice	120	900	3200
Vegetables	120	700	1400

9. a) Explain Lacey's silt theory.

   b) Using Kennedy's theory, design a channel section for the following data.

   Discharge Q = 14 cumecs

   Kutter's N = 0.0225

   Critical velocity ratio m = 1

   Side slopes ½:1

   Bed slope = 1/5000