3016

Water Resources Engineering - I
(New) (1220)

P. Pages : 3

Time : Three Hours

Max. Marks : 100

Instructions to Candidates :
1. Do not write anything on question paper except Seat No.
2. Answersheet should be written with blue ink only. Graph or diagram should be drawn with the same pen being used for writing paper or black HB pencil.
3. Students should note, no supplement will be provided.
4. Answer **any two** questions from each unit.
5. Black figure on the right indicate full marks.
6. Neat diagrams should be drawn wherever necessary.
7. Assume suitable data, if necessary.
8. It is advised to solve all parts of questions in one section.

UNIT - I

1. a) What are the methods of determining average precipitation over an area ? Describe merit of each.   **5**

   b) For a storm of 2 – hour duration, the rainfall rates are as follows: **5**

Time period (Minute)	20	20	20	20	20	20
Rainfall Rate (cm/hr)	2.5	2.5	10.0	7.5	5.1	1.25

   If ϕ index is 3 cm/hr Estimate the surface runoff. Also determine W - index.

2. a) What are the basic conditions for the occurrence of precipitation ? Explain how these conditions are satisfied.   **5**

   b) Determine the average rainfall over the catchment by the Thiesson's polygon method for the data given in table below.   **5**

Precipitation station	Area of Thiesson polygon (Ar) Km^2	Precipitation (Pi) (cm)
P_1	50	3.5
P_2	105	4.2
P_3	84	5.4
P_4	145	4.8
P_5	45	4.4

3. a) What is evaporation ? How would you measure evaporation ?   **5**

   b) Differentiate between consumptive use and evapotranspiration.   **5**

UNIT - II

4. a) Explain the following terms: 5
   i) Runoff   ii) Yield of catchment.

   b) The ordinates of a 3 - hr unit hydrograph of a basin at 6 hr. interval are given below 0, 3, 5, 9 , 11, 7, 5, 4, 2, 1, 0, cumecs. Derive the storm hydrograph due to a 3 - hr storm with a total rainfall of 15 cm. Assume an initial loss of 0.5 cm and a ϕ index of 1cm/hr. Take base flow = 4 cumecs.   5

5. Find out the ordinates of a storm hydrograph resulting from a 9 - hr storm with rainfall of 2.0, 5.75 and 2.75 cm during subsequent 3 - hr interval. The ordinates of 3 - hr unit hydrograph at 3 hr - interval as follows: 0, 100, 355, 510, 380, 300, 260, 225, 165, 120, 85, 55, 30, 22, 10, 0 (cumecs). Assume an initial loss of 0.5 cm, an infiltration index of 0.25 cm/hr and a base flow of 10 cumecs.   **10**

6. a) What is the moving boat technique of measurement of discharge ?   **5**

   b) What is distribution hydrograph ? What is its use.   **5**

UNIT - III

7. a) Differentiate between confined and unconfined aquifer with the help of neat sketch.   **5**

   b) A fully penetrating well of diameter 0.4 m is drilled in a confined aquifer 2.5 m thick. If the steady - state draw downs at 10 m and 50 m are observed to be 2.50m and 0.5 m. Determine the discharge. Take $K = 1 \times 10^{-3} m/s$.   **5**

8. Derive Dupuit - Thiem's equation for the yield of a well penetrating an unconfined aquifer. What are the basic assumptions of the theory.   **10**

9. a) Explain the importance of drainage in irrigated soils ? What are the different types of drainage system ?   **5**

   b) Determine the area of the land that can be drained by oliter 2.0 m deep and having a base width of 1.5 m. Take bed slope of 1 in 4000 and the side slopes as 1:1 The drainage coefficient is 1.0 cm/day. Use Elliot's formula.   **5**

UNIT - IV

10. Write a detailed note on reservoir sedimentation. How do you estimate the probable life of reservoir ? What are the factors affecting sedimentation ?   **10**

11. The following information is available regarding the relationship between trap efficiency and capacity inflow ratio for a reservoir :-

$\frac{Capacity}{inflow}$ ratio	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
Trap efficiency ($n\%$)	87	93	95	95.5	96	96.5	97	97.2	97.3	97.5

Find the probable life of the reservoir with an initial reservoir capacity of 30 million cubic meters, if the annual flood inflow is 3,60,000 tonnes. Assume a sp. wt. of sediment equal to 1200 kg/m^3. The useful life of the reservoir will terminate when 80% of initial capacity is filled with sediment.   **10**

12. a) Mention the various investigations required for the reservoir planning.   **5**

b) What are the factors in which selection of site of a reservoir depend.   **5**

UNIT - V

13. 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%.   **10**

Crop	Base period (day)	Duty at the field (hector/anm)	Area under the crop (hectors)
Wheat	120	1800	4800
Sugar-cane	360	800	3600
Cotton	200	1400	2400
Rice	120	900	3200
Vegetable	120	700	1400

14. a) The left branch canal carrying a discharge of 20 cumecs has culturable commanded area of 20000 hectors. The intensity of Rabi crop is 80% and the base period is 120 days. The right branch canal carrying discharge of 8 cumecs has CCA of 12000 hectors, intensity of irrigation of Rabi crop is 50% and the base period is 120 days. Compare the efficiencies of the two canal system.   **5**

b) Compare surface Irrigation with sub-surface Irrigation.   **5**

15. a) Describe with the help of a diagram various forms of a soil moisture. What do you understand by the available moisture ?   **5**

b) Explain the terms "Duty" and "Delta". Derive a relationship between the two.   **5**

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