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M S RAMAIAH INSTITUTE OF TECHNOLOGY

(AUTONOMOUS INSTITUTE, AFFILIATED TO VTU)

BANGALORE – 560 054

SEMESTER END EXAMINATIONS – JANUARY 2015

Course & Branch	:	**B.E: Civil Engineering**	**Semester**	:	**V**
Subject	:	**Hydrology and Water Resources Engineering**	**Max. Marks**	:	**100**
Subject Code	:	**CV505**	**Duration**	:	**3 Hrs**

Instructions to the Candidates:

- Answer one full question from each unit.
- Assume the missing data suitably.

UNIT – I

1. a) Discuss the following: (10)

   (i) Hydrologic cycle (ii) Hyetogragh (iii) Theissen polygon method (iv) raingauge network

   b) A storm commenced at 7 hours. The ordinates of the rainfall mass curve of this storm in mm as recorded by recording raingauge at 15 mins intervals are 0,9.5,17,27,40.5,49,63,84,95,102,110,112 and 112. Construct the hyetograph of this storm for a uniform interval of 15 minutes. (10)

2. For a station 'A', the recorded annual 24-hour maximum rainfall are given below. (i) Estimate the 24-hour maximum rainfall with return periods of 13 and 50 years (ii) What would be the probability of rainfall of magnitude equal to or exceeding 10 cm occurring in 24 hours at station A. (20)

Year	1950	'51	'52	'53	'54	'55	'56	'57	'58	'59	'60	'61
Rain-fall (cm)	13	12	7.6	14.3	16	9.6	8	12.5	11.2	8.9	8.9	7.8

Year	1962	'63	'64	'65	'66	'67	'68	'69	'70	'71
Rain-fall (cm)	9.0	10.2	8.5	7.5	6.0	8.4	10.8	10.6	8.3	9.5

UNIT – II

3. a) Describe various abstractions. Explain the factors affecting runoff (10)

   b) Explain the following (10)

   (i) Horton's infiltration curve (ii) Rainfall-runoff correlation (iii) Φ-Index (iv) Evaporation pans

4. a) Enumerate the empirical formulae used in estimating runoff from a catchment (10)

b) The following mass curve was obtained for a 14-hour effective rainfall period that occurred on a catchment area of 25 km^2. Calculate the ordinates of the effective rainfall hyetograph and the runoff volume, when the Φ index is 0.35cm/hour. (10)

Time (hour)	0	2	4	6	8	10	12	14
Accumulated rainfall (cm)	0	1.0	3.0	5.5	7.7	8.0	9.0	10.0

UNIT – III

5. a) What is stream gauging? Brief various methods of estimating discharge in a stream (10)

b) A storm over a catchment of area 5.0 sqkm had a duration of 14 hours. The mass curve of rainfall of the storm is as follows. (10)

Time from start of storm (hour)	0	2	4	6	8	10	12	14
Accumulated rainfall (cm)	0	0.6	2.8	5.2	6.6	7.5	9.2	9.6

If the Φ-index for the catchment is 0.4 cm/h, determine the effective rainfall hyetograph and the volume of direct runoff from the catchment due to the storm.

6. a) Explain unit hydrograph theory, also give the assumptions made. Outline the procedure for the derivation of unit hydrograph of duration D-hours (10)

b) Ordinates of a 4-hour unit hydrograph are given. Using this derive the ordinates of 2-hour unit hydrograph for the same catchment. (10)

Time (h)	0	4	8	12	16	20	24	28	32	36	40	44
4-h UH (m^3/s)	0	20	80	130	150	130	90	52	27	15	5	0

UNIT – IV

7. a) Illustrate the following (10)
   (i) Zone of aeration
   (ii) Confined aquifer
   (iii) Perched water table
   (iv) Influent stream
   (v) effluent stream

b) Define specific field and specific retention. when 3.68 million m^3 of water was pumped out from an unconfined aquifer of 6.2 km^2 areal extent, the water table was observed to go down by 2.6 m. what is the specific yield of the aquifer? During a monsoon season if the water table of the same aquifer goes up by 10.8 m what is the volume of recharge? (10)

8. a) Derive an expression for the discharge in the case of steady radial flow to a well in a confined aquifer (10)

b) A 30 cm well completely penetrates an unconfined aquifer of saturated depth 40 m. After a long period of pumping at a steady rate of 1500 lpm, the drawdown (10)

in two observation wells 25 and 75 m from the pumping well were found to be 3.5 and 2.0 m respectively. Determine the transmissivity of the aquifer. What is the drawdown at the pumping well?

UNIT – V

9. a) Illustrate the following: (10)
   (i) Dead storage
   (ii) Useful storage
   (iii) maximum pool level
   (iv) surcharge storage
   (v) Valley storage

   b) The monthly runoff volumes in million m3 for a period of 24 months (2 water years) recorded at a stream gauging site are (10)

   3,6,16,30,18,15,10,8,6,4,3,1,2,5,17,28,20,15,12,7,5,4,3 and 2.

   Determine the size of the reservoir proposed at the gauging site if it is to maintain an assured supply of 8.33 million m3 per month. The water year may be taken as June to May.

10. a) What is meant by flood routing? Explain the method of reservoir routing by ISD method (10)

    b) Explain the following (10)
    (i) Rational method (ii)PMF (iii) Levees (iv) Types of reservoirs

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