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M S RAMAIAH INSTITUTE OF TECHNOLOGY

(AUTONOMOUS INSTITUTE, AFFILIATED TO VTU)

BANGALORE – 560 054

SEMESTER END EXAMINATIONS – DEC 2013 / JAN 2014

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.

UNIT – I

1. a) Explain briefly three different types of precipitation. (06)
   b) What are recording gauges? Give their relative merits and demerits over the non-recording gauges. (08)
   c) For a drainage basin of 600 km², isohyetals drawn for a storm gave the following data: (06)

Isohyetals (interval) (cm)	15-12	12-9	9-6	6-3	3-1
Inter-isohyetal area (km²)	92	128	120	175	85

   Estimate the average depth of precipitation over the catchment.

2. a) Define the following: (08)
      1. Catchment   2. Drainage density   3. Stream density   4. Form Factor
   b) Describe the three methods of determining the average depth of rainfall over an area. (06)
   c) The normal annual precipitation of five raingauge stations P, Q, R, S and T are respectively 125, 102, 76, 113, and 137 cm. During a particular storm, the instrument at station T was inoperative and the precipitation recorded by stations P, Q, R and S are 13.2, 9.2, 6.8 and 10.2 respectively. Estimate the rainfall at station T during that storm. (06)

UNIT-II

3. a) What are the factors affecting evaporation? Explain them briefly (06)
   b) Explain the estimation of evaporation by IS-Pan method. Also define *pan coefficient* and state its necessity. (08)
   c) Explain briefly: 1. Infiltration capacity   2. Φ – index (06)

4. a) A catchment of area 0.25 km² is subjected to a storm with the following profile: (08)

Time (hr)	1	2	3	4	5	6
Rainfall Intensity (mm/hr)	7	18	25	12	10	3

If the volume of storm runoff is 8250 m³, estimate the φ-index.

b) Define runoff. Explain in detail, the factors affecting runoff. (12)

UNIT-III

5 a) Define hydrograph. With a neat sketch, explain various elements of a flood hydrograph. (08)

b) Given the ordinates of a 4-h unit hydrograph as below derive the ordinates of a 12-h unit hydrograph for the same catchment. (08)

Time (h)	0	4	8	12	16	20	24	28	32	36	40	44
Ordinates of 4-h UH	0	20	80	130	150	130	90	52	27	15	5	0

c) Define: (04)
   (i) Direct runoff
   (ii) Rainfall excess

6. a) What is a unit hydrograph? What are its assumptions and uses? (10)

b) The ordinates of a 4-hour unit hydrograph for a particular basin are given below. Determine the ordinates of the S-curve hydrograph and therefore the ordinates of the 6-hour unit hydrograph. (10)

Time (hr)	0	2	4	6	8	10	12	14	16	18	20	22	24
4hr UH ordinates (cumecs)	0	25	100	160	190	170	110	70	30	20	6	1.5	0

UNIT-IV

7. a) Explain the following terms: (10)
   (i) Specific yield
   (ii) Specific retention
   (iii) Confined aquifer
   (iv) Transmissibility
   (v) Porosity

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 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 transmissibility of the aquifer. What is the drawdown of the pumping well? (10)

8. a) Derive the expression to determine the discharge for the steady radial flow (10)

to a well in an unconfined aquifer

b) At station A, the water table elevation is 642m above the mean sea level, (06) and at B, the elevation is 629m. The stations are 1100 m apart. The aquifer has a permeability of 1.5×10^{-6} m/s and a porosity of 24 percent. What is the actual velocity in the aquifer?

c) Explain Darcy's law. (04)

UNIT-V

9. a) The highest annual floods for a river for 60 years were statistically (08) analysed. The sixth largest flood was 30,000 cumec. Determine:
   - (i) The period in which the flood of 30,000 cumec may reoccur once
   - (ii) The percentage chance that this flood may occur in any one year
   - (iii) The percentage chance that this flood may not occur in the next 20 years
   - (iv) The percentage chance that this flood may occur once or more in the next 20 years

b) List out different methods of avoiding damage by floods. (08)

c) Differentiate between Probable Maximum Flood and Design Flood (04)

10. a) With a neat sketch, explain the different zones of storage in a reservoir. (08)

b) What is a reservoir mass curve? What are its uses? With a neat sketch, (12) explain how it is useful in determining the storage capacity of a reservoir.

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