

[Total No. of Questions - 9] [Total No. of Printed Pages - 3]
(2125)

15129
B. Tech 5th Semester Examination
Hydrology (OS)
CE-5003

Time : 3 Hours

Max. Marks : 100

The candidates shall limit their answers precisely within the answer-book (40 pages) issued to them and no supplementary/continuation sheet will be issued.

Note : The question paper consists of five Sections A, B, C D and E. A candidate is required to attempt five questions in all selecting one question from each section A, B, C and D and all subparts of Section E. Use of non-programmable calculator is allowed.

SECTION - A

1. Explain the hydraulic cycle in nature with the help of a neat sketch, indicating its various phases. (20)
2. (a) Define 'rain-gauge density' and explain how you would determine the optimum number of rain-gauges to be installed in a given basin.

(b) In a certain river basin there are six rain-gauge stations. The normal annual rainfall depths recorded at the stations being 42.4, 53.6, 67.8, 78.5, 82.7 and 95.5 cm, respectively. Determine the optimum number of rain-gauge stations to be established in the basin if it is desired to limit the error in the mean value of rainfall over the catchment to 10% and also indicate how you distribute them. (10+10=20)

[P.T.O.]

2

15129

SECTION - B

3. (a) Enumerate the factors that affect Evapotranspiration.

(b) Assuming a growing season of 4 months December-March for wheat, determine the consumptive use of wheat in the month of January if the pan evaporation for the month is 9.5 cm. Take the consumptive use coefficient at 40%, stage growth of the crop as 0.52. (8+12=20)
4. (a) Define:
(i) ϕ -index
(ii) W-index

(b) The rates of rainfall for the successive 30 min period of a 3-hour storm are: 1.6, 3.6, 5.0, 2.8, 2.2, 1.0 cm/hr. The corresponding surface runoff is estimated to be 3.6 cm. Determine ϕ -index and W-index. (6+14=20)

SECTION - C

5. (a) What do you understand by 'a 6-hour unit hydrograph'?

(b) A 30 minutes unit hydrograph for a catchment of 1.43 sq. km. area is given below:

Time (Min.)	0	15	30	45	60	75	90	105	120	135	150	165	180
Ordinate of UH (m ³ /s)	0	0.5	1.2	2.3	2.8	2.6	2.2	1.6	1.2	0.8	0.5	0.2	0.0

- Determine, (i) the volume of direct runoff, (ii) depth of direct runoff and (iii) the direct runoff hydrograph for a 30 min period with rainfall excess of 2.5 cm. (6+14=20)
6. (a) What are the methods of estimating runoff from a catchment?

(b) Give three empirical formulae applicable to particular regions in India. (8+12=20)

SECTION - D

7. Derive an expression for discharge from an unconfined aquifer. State the assumptions made for the said derivation.
(14+6=20)
8. A 200 mm well penetrates 30 m below static water level (GWT). The well was pumped at a rate of 1800 lpm. After a long period, the drawdowns in the two observation wells at 10 m and 30 m from the pumped well are 1.2 m and 0.5 m, respectively. Determine:
- Transmissibility of the aquifer.
 - Drawdown in the pumped well assuming $R = 300$ m.
 - Specific capacity of the well. (20)

SECTION - E (Compulsory)

9. (a) Explain the difference between Convective and Cyclonic precipitation.
- (b) Explain what you understand by Arid, semi-arid and humid regions
- (c) Explain the difference among: evaporation, transpiration and evapotranspiration.
- (d) Define hydrograph. Draw a single-peaked hydrograph and indicate its various components.
- (e) Following velocities were recorded in a stream with a current meter.
- | | | | | | |
|----------------------|---|-----|-----|-----|-----|
| Depth above bed (m): | 0 | 1 | 2 | 3 | 4 |
| Velocity (m/sec): | 0 | 0.5 | 0.7 | 0.8 | 0.8 |
- Find the discharge per unit width of stream near the point of measurement. Depth of flow at the point was 5 m.
(20)