

[Total No. of Questions - 9] [Total No. of Printed Pages - 4]
(2123)

1380

B. Tech 5th Semester Examination

Hydrology (O.S.)

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. Prepare a simple schematic diagram of the hydrologic cycle identifying the key sources of precipitation (P), evaporation (E), transpiration (T), surface runoff (R), infiltration (I) and ground water flow (G). **(20)**
2. (a) Briefly explain the Arithmetic mean and Thiessen's Polygon method used to estimate the areal precipitation.

(b) A 3-hour storm occurred at a place and the precipitations in the neighbouring rain-gauge stations P, Q and R were measured as 3.8, 4.1 and 4.5 cm, respectively. The precipitation in the neighbouring station S could not be measured. The normal precipitation in the four stations P, Q, R and S were 45, 48, 53 and 50 cm, respectively. Estimate the storm precipitation at station S. **(10+10=20)**

1380/1700

[P.T.O.]

SECTION - B

3. Estimate the amount of annual Evapotranspiration (ET) in mm from a watershed having an area of 20,000 km² if the watershed receives 100 mm of rain over the year and the river draining the area has an annual flow rate of 100 m³/s. **(20)**
4. The infiltration rate for the excess rainfall over a small watershed was observed to be 100 mm/h in the beginning of a rainstorm, which decreases exponentially to an equilibrium rate of 10 mm/h after 10 hours. The watered infiltrated during the 10 hours was measured as 100 mm. Estimate the value of 'k' for the Horton's equation. **(20)**

SECTION - C

5. (a) Briefly define unit hydrograph and give two important underlined assumptions associated with the unit hydrograph linear model.
- (b) The 30-min unit hydrograph for a 2.25 km² urban catchment is given below:

| | | | | | | | | | | | | | | |
|----------------------------|---|-----|-----|-----|-----|-----|-----|------|------|------|-----|------|------|-----|
| Time (min) | 0 | 30 | 60 | 90 | 120 | 150 | 180 | 210 | 240 | 270 | 300 | 330 | 360 | 390 |
| Runoff (m ³ /s) | 0 | 1.2 | 2.8 | 1.8 | 1.4 | 1.2 | 1.0 | 0.92 | 0.75 | 0.62 | 0.5 | 0.28 | 0.18 | 0 |

Estimate the runoff resulting from the following storm occurring over the catchment.

| Time (min) | Rainfall excess (cm) |
|------------|----------------------|
| 0-30 | 3.0 |
| 30-60 | 2.5 |
| 60-90 | 1.8 |

(10+10=20)

6. (a) Describe the principle involved in the measurement of stream flow by the dilution method. What are the requisites of a good tracer used in the dilution method ?
- (b) Three points on a smooth curve drawn to best represent the stage-discharge data of a stream have the following co-ordinates:

| | | | |
|-----------------------------|--------|--------|--------|
| Stage y (m) | 315.56 | 316.44 | 318.73 |
| Runoff Q(m ³ /s) | 50 | 250 | 1250 |

Develop an equation of the form $Q = K (y - a)^b$. **(10+10=20)**

SECTION - D

7. (a) Define 'transmissibility' and 'storage coefficient' of an aquifer.
- (b) Calculate the discharge from a tube well of 200 mm diameter penetrating fully confined aquifer of 20-m thick having a permeability of 40 m/day. The drawdown in the well is 3 m and at 300 m from the well is zero. If the diameter of the well is doubled, find the percentage increase in the yield, the other conditions remaining the same. **(8+12=20)**
8. Distinguish between:
- Specific capacity of a well and specific yield of an aquifer.
 - Aquifer and aquiclude.
 - Open well and tube well.
 - Water table and artesian aquifers **(20)**

[P.T.O.]

SECTION - E

9. Answer all the parts:
- (a) List out the state and central agencies which are undertaking the hydrological data in our country.
 - (b) Distinguish between cyclone and anticyclone.
 - (c) Explain normal ratio method of estimating missing rainfall data.
 - (d) Distinguish between instantaneous and synthetic unit hydrograph.
 - (e) List out the factors that influence the selection of a site for a stream gauging station. **(5×4=20)**