## B.E. Civil Engineering Fourth Semester

CE-404 - Hydrology \& Water Resources
P. Pages : 2

Time : Three Hours

## GUG/W/18/1536

Max. Marks : 80

Notes: 1. All questions carry equal marks.
2. Answer all questions.
3. Due credit will be given to neatness and adequate dimensions.
4. Assume suitable data wherever necessary.
5. Illustrate your answers wherever necessary with the help of neat sketches.
6. Non programmable calculator is allowed.

1. a) Explain with neat sketch the different types of precipitations. due to the storm lasting for 24 hrs , assuming the storm center to be located at the center of the area. The Isohyetal map for the storm save the areas enclosed between different isohytes as follows :

| Isohyte in num | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 |
| :--- | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Enclosed area in sqkm | 543 | 1345 | 2030 | 2545 | 2955 | 3280 | 3535 | 3710 |

OR
2. a) Enlist the recording and non recording rain gauges. Describe in detail any one non recording gauge.
b) In a catchment whose shape can be approximated by a Pentagon, four rain gauge stations are situated inside the catchment. The co-ordinates of the corners of the catchment that define its boundaries and the co-ordinates of flour rain gauge stations are given below, with annual rainfall.
Determine the average annual rainfall over the catchment by Thiessen polygon method.

| Catchment <br> boundary | Corner | a | b | c | d | e |
| :--- | :--- | :---: | :---: | :---: | :---: | :---: |
|  | Co-ordinates | $(0,0)$ | $(120,0)$ | $(120,80)$ | $(16,140)$ | $(0,80)$ |
| Rain gauge <br> stations | Station | P | Q | R | S | - |
|  | Co-ordinates | $(40,20)$ | $(80,20)$ | $(80,60)$ | $(40,80)$ | - |
|  | Annual <br> Rainfall cm) | 120 | 110 | 100 | 125 | - |

3. a) Define infiltration capacity curve? Derive the equation for calculation of exponential constant K of Hortan's equation of Infiltration capacity curve.
b) Describe Dalton's law of evaporation state various methods of evaporation estimation by pans. Explain any one in detail.
c) Describe water budget method for estimation reservoir evaporation.

## OR

4. a) A Reservoir with a surface area of 300 ha has the following average metrological values during a given week.
Water temp $-30^{\circ} \mathrm{C}$, Relative humidity $-50 \%$,
wind velocity at 1 m above ground $-12 \mathrm{~km} / \mathrm{hr}$, mean barometer reading -750 mm of Hg , Estimate the average daily evaporation from the lake reservoir and the volume of water evaporated from the lake during this lake make use of Meyer's formula and Rohwer's

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formula to compare the result. Consider reservoir as large deep pool and saturated vapour pressure at $30^{\circ} \mathrm{C}$ as 31.82 mm of Hg .
b) Explain soil moisture depletion studies for evapotranspiration estimation.
5. a) What are the different factors affecting runoff process.
b) Define stream density, drainage density, form factor and compactness co-efficient.
c) The following data was collected for a stream at a gauging station. Calculate discharge.

Equation of current meter, $\mathrm{V}=0.3 \mathrm{~N}+0.05$.

| Distance from one end <br> of water surface $(\mathrm{m})$ | Depth <br> $(\mathrm{m})$ | Immersion of current meter <br> below water surface |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | at 0.6 d |  | at 0.2 d |  | at 0.8 d |  |
|  |  | Rev | Sec | Rev | Sec | Rev | Sec |
| 3 | 1.4 | 12 | 50 |  |  |  |  |
| 6 | 3.3 | - | - | 38 | 52 | 33 | 55 |
| 9 | 5.0 | - | - | 40 | 58 | 30 | 54 |
| 12 | 9.0 | - | - | 48 | 60 | 34 | 58 |
| 15 | 5.4 | - | - | 34 | 52 | 30 | 50 |
| 18 | 3.8 | - | - | 35 | 52 | 30 | 54 |
| 21 | 1.8 | 18 | 50 | - | - | - | - |
| OR |  |  |  |  |  |  |  |

6. a) What is base flow? How it is separated from total runoff?
b) Give below are-the ordinates of a 4 Hr unit hydrograph for a catchment. Calculate the ordinates of unit hydrograph for 6 Hr duration using S - Curve hydrograph.

| Time in hrs | 0 | 4 | 8 | 12 | 16 | 20 | 24 | 28 |
| :--- | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Ordinate of $4 \mathrm{Hr} \mathrm{UH}\left(\mathrm{m}^{3} / \mathrm{sec}\right)$ | 0 | 10 | 30 | 25 | 18 | 10 | 5 | 0 |

7. a) Define flood? What are the causes of flood? Define different types of floods based on it's magnitude.
b) Peak flow records for a river at a station where a reservoir is to be constructed for a period of 80 yrs is as follows :
The arithmetic mean of peaks - 7820 cumecs
Standard deviation $-2500 \mathrm{~m}^{3} / \mathrm{sec}$. using Gumbel's method, determine the recurrence interval for a period of 15000 cumecs.

## OR

8. a) Enlist and describe the methods for estimating design peak flood based on probability theory.
b) Explain the process of cost benefit ratio of the projects.
c) Describe River forecasting.
9. a) Explain with neat sketch the occurrence of grounder water.
b) Define perched water table, leaky confined aquifer and non leaky confined aquifer.
c) Explain step by step process of planning for exploration of ground water.

## OR

10. a) What are the ground water provinces in India.
b) Explain Dupuit theory for the well fully penetrate an unconfined aquifer.
