



DIPLOMA IN CIVIL ENGINEERING

CENTRALIZED QUESTION BANK

**4010653 - Water Resources Engineering
Laboratory**

**DIRECTORATE OF TECHNICAL
EDUCATION GOVERNMENT OF
TAMILNADU**

DIPLOMA END SEMESTER / YEAR EXAMINATION – 2023

Course : Civil Engineering

Subject : Water Resources Engineering Laboratory

QP Code : 4010653

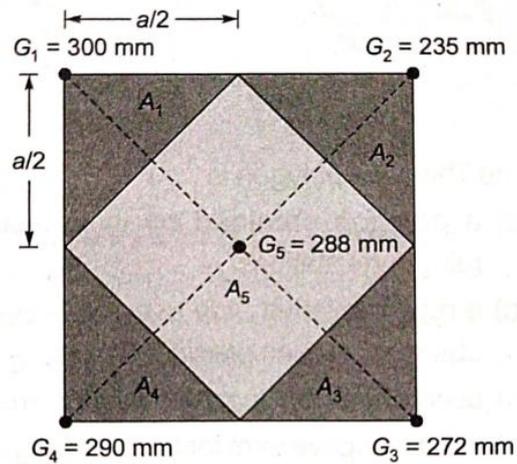
Time : 3 Hours Date :

Session:

Max Marks: 100

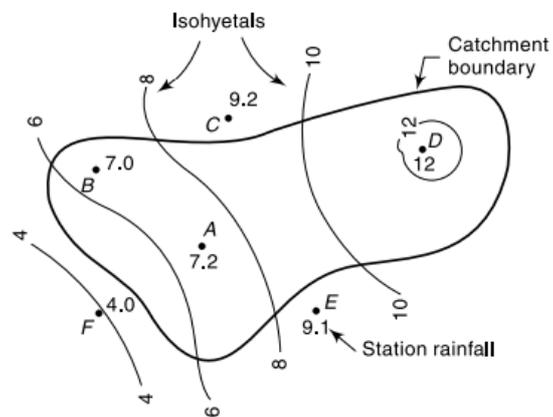
Answer the Flowing Question

1. A catchment area is idealized as a 25 km x 25 km square. It has five rain gauges, one at each corner and one at the centre, as shown in the figure. During a month, the precipitation at these gauges is measured as $G_1=300$ mm, $G_2=285$ mm, $G_3=272$ mm, $G_4=290$ mm and $G_5=288$ mm. Calculate the average precipitation (in mm) over the catchment area during this month by using the Thiessen Polygon method.



(95 Marks)

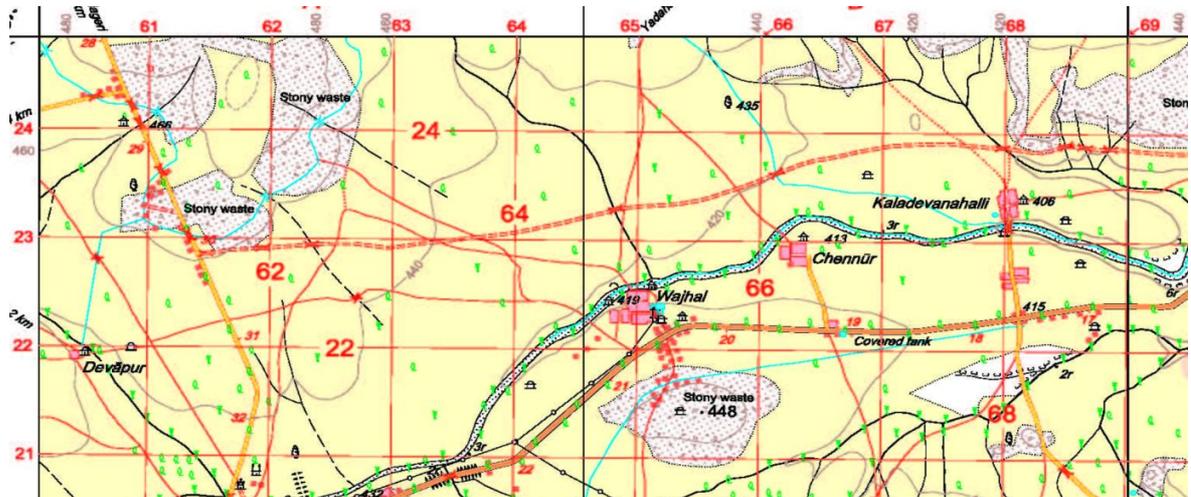
2. The isohyets due to a storm in a catchment were drawn as shown in the figure and the area of the catchment bounded by isohyets were tabulated as below:
Estimate the mean precipitation due to the storm by isohyetal method and arithmetic mean method.



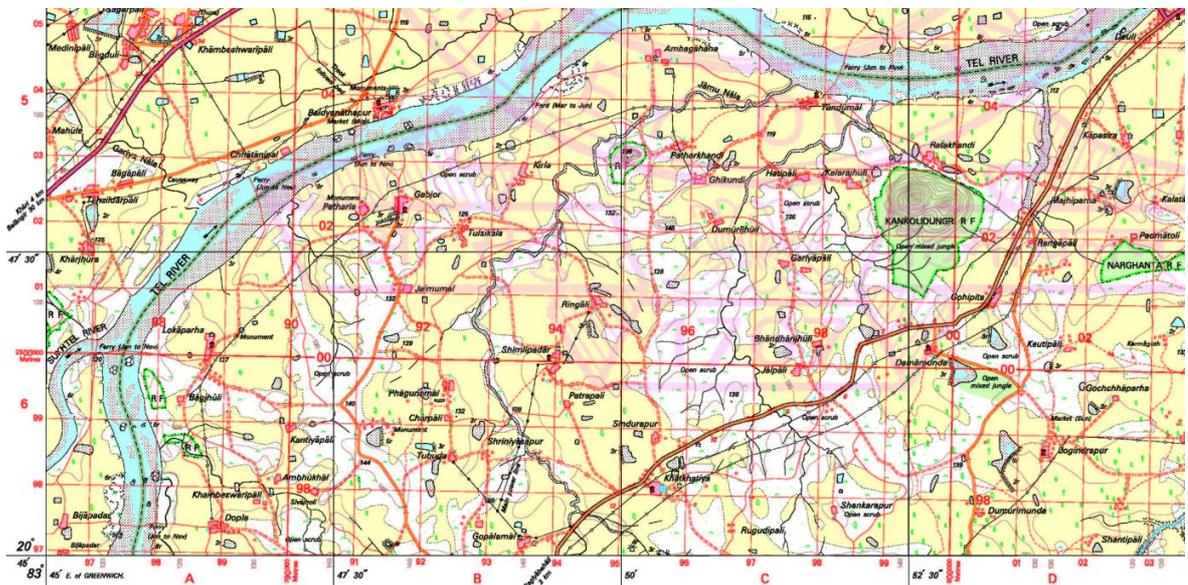
Isohyets (cm)	Area (sq.km)
Station-12.0	30
12.0-10.0	140
10.0-8.0	80
8.0-6.0	180
6.0-4.0	20

(95 Marks)

3. Delineate the contributory area for the given outlet from the given Toposheet



Sample Toposheet-1 (part of Toposheet from educational map series of Survey of India)
(For better quality Toposheet download from the official website
<https://www.surveyofindia.gov.in/pages/educational-map-series> and provide the map separately)



Sample Toposheet-2 (part of Toposheet from educational map series of Survey of India)
(For better quality Toposheet download from the official website
<https://www.surveyofindia.gov.in/pages/educational-map-series> and provide the map separately)

(95 Marks)

4. Irrigation water is to be provided to a crop in a field to bring moisture content of the soil from the existing 18% to the field capacity of the soil at 28%. The effective root zone of the crop is 70 cm. If the densities of the soil and water are 1.3 g/cc and 1.0 g/cc respectively. Determine the depth of irrigation water (in mm) required for irrigating the crop.

(95 Marks)

5. A field canal has a Cultivable Commanded Area of 2000 hectares. The intensities of irrigation for gram and wheat are 30% and 50% respectively. Gram has a kor period of 18 days, kor depth of 12 cm, while wheat has a kor period of 18 days and a kor depth of 15 cm. Determine the discharge capacity (in cu.m./s) required in the field canal to supply water to the commanded area during the kor period.

(95 Marks)

6. Monthly inflow rates during a low-water period at the site of a proposed dam are tabulated in Col.(2), the corresponding monthly pan evaporation and precipitation at a nearby station are also tabulated in Col.(3) and Col.(4) in the below table. Prior water rights require a release of full natural flow or 15 hectare-metres per month, whichever is minimum. If the estimated monthly demands are as given in Col.(5) and the net increased pool area is 400 hectares, find the required storage capacity of the reservoir.

Assume pan evaporation coefficient = 0.7 and assume that only 28% of the rainfall on the land area to be flooded by the reservoir has reached the stream in the past.

(95 Marks)

<i>Month</i>	<i>Inflow at dam site in hectare-metres</i>	<i>Pan evaporation in cm</i>	<i>Precipitation in cm</i>	<i>Demand in hectare-metres</i>
(1)	(2)	(3)	(4)	(5)
<i>January</i>	1.2	1.8	1.3	15.8
<i>February</i>	0.0	1.8	1.7	14.3
<i>March</i>	0.0	2.6	0.6	9.6
<i>April</i>	0.0	10.2	0.0	4.8
<i>May</i>	0.0	15.4	0.0	3.5
<i>June</i>	0.0	16.6	1.1	3.4
<i>July</i>	240.0	10.8	16.1	5.0
<i>August</i>	480.0	11.7	16.4	5.0
<i>September</i>	1.0	10.8	2.2	10.0
<i>October</i>	0.6	9.6	0.8	15.6
<i>November</i>	0.5	7.8	0.0	16.8
<i>December</i>	0.2	2.0	0.0	16.8
Σ	723.5	101.1	40.2	120.6

7. Following are the control levels of a dam. Calculate the Free board, Surcharge storage, Gross storage, Live storage and Dead storage of the dam using below data. Also Draw a neat sketch of the dam and mark these levels.
Top Bund Level (TBL): R.L. +95.000 m
Maximum Water Level or High Flood Level (HFL): R.L. +92.000 m
Full Supply Level (FSL): R.L. +86.000 m
Lowest Water Level or Minimum Drawdown Level: R.L. +52.500 m (95 Marks)
8. Draw a neat sketch and label the component parts of an Earthen Dam section. (95 Marks)
9. Draw the elementary (theoretical) and practical profile of a Low gravity dam. Label the sketch with design requirements. (95 Marks)
10. Write down the technical details with sufficient sketches describing any one micro or minor irrigation scheme (95 Marks)
11. Prepare a maintenance report for any major/minor irrigation project. (95 Marks)
12. Draw a neat sketch and label the component parts of Diversion Head works and typical cross section details of weirs and barrages (95 Marks)
13. Draw typical cross section details of cross drainage works
1. Aqueducts 2. Syphon aqueducts 3. Super passage 4. Canal syphon 5. Level crossing and 6. Canal inlets. (95 Marks)
14. Design an irrigation canal of trapezoidal shape to carry a discharge of 15 cumecs when the maximum permissible velocity is 0.8 m/s. Assume the bed slope = 1 in 4000, side slope = 1 :1 and Manning's 'N'=0.025. Also estimate the quantity of material required for lining the canal (in sq.m. per unit length of canal) (95 Marks)