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**University Examinations 2015/2016**

SECOND YEAR SECOND SEMESTER EXAMINATION FOR DIPLOMA IN CIVIL ENGINEERING

**ECV 2255: ENGINEERING HYDROLOGY**

 **DATE: NOVEMBER 2015 TIME: 11/2 HOURS**

**INSTRUCTIONS:** *Answer question* ***one*** *and any other* ***two*** *questions*

**QUESTION ONE (30 MARKS)**

1. Define the term hydrology. (2 Marks)
2. Define the term precipitation. (2 Marks)
3. Determine the optimum number of raingauges in a basin from the following data so as to limit the percentage error within 10%. Existing stations =5 no. Average rainfall at stations=90,80,54,45,41 cm. (5 Marks)
4. State three advantages of Thiessen Polygon method. (3 Marks)
5. State three advantages and two disadvantages of recording rain gauges (5 Marks)
6. State two advantages of isohyetal method. (2 Marks)
7. State three types of recording rain gauges. (3 Marks)
8. During a month, a rain gauge went out of order while the other four gauges in the basin reported rainfalls of 107,89,120 and 118 mm. If the annual rainfalls for these four gauges are 1120, 935, 1200 and 997 mm respectively and normal annual rainfall of the broken gauge is 978 mm, estimate the missing monthly rainfall at the broken gauge. (5 Marks)
9. State any three factors considered when selecting a raingauge site. (3 Marks)

**QUESTION TWO (15 MARKS)**

1. A catchment area has eight rain gauge stations. The depth of rainfall in mm and Thiessen Polygon areas within the catchment boundary for each station are as given below. Determine the average depth of rainfall. (7 Marks)

**Station No. Rainfall (mm) Thiessen Polygon (km2)**

1 49 9.2

2 62 104

3 84 50.2

4 96 38.4

5 124 8.4

6 78 48.5

7 64 41.5

8 55 2.8

1. The analysis of a storm yielded the following information regarding isohyets. Calculate the average depth of rainfall. (6 Marks)

**Isohyets interval (mm) Area in km2**

70-80 10

80-90 85

90-100 113

100-110 98

110-120 136

120-130 67

1. The annual rainfall (cm) at a place for a period of 10 years from 1971 to 1980 are respectively 30.3, 41.0,33.5,34.0,33.3,36.2,33.6,30.2,35.5,36.3. Determine the mean and median values of rainfall for the place. (2 Marks)

**QUESTION THREE (15 MARKS)**

1. The annual rainfalls at 7 rain gauge stations are 58, 94, 60,45,20,88 and 68 cm respectively. What is the percentage accuracy of the existing network in the estimation of the average depth of rainfall over the basin? How many additional rain gauges are required if it is desired to limit the error to only 10%? (10 Marks)
2. The normal rainfalls at stations A,B,C and D in a basin are 920.1, 762.8, 675.9 and 809.7 mm respectively. In the year 1755 the station D was not in operation and stations, A, B and C recorded annual precipitations of 911.1 mm, 722.3 mm and 798.9 mm respectively. Estimate the rainfall at station D in that year. (5 Marks)

**QUESTION FOUR (15 MARKS)**

Using the following data compute the river discharge by mid-section and mean-section methods. (15 Marks)

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Distance from bank (m) | 2.2 | 4.4 | 6.5 | 10.0 | 13.0 | 16.5 | 19.6 | 21.7 | 24 | 25 |
| Depth (m) | 0.8 | 1.8 | 3.2 | 3.7 | 3.0 | 2.8 | 2.6 | 2.4 | 2.0 | 0 |
| Mean velocity (m/s) | 0.306 | 0.415 | 0.659 | 0.868 | 0.690 | 0.703 | 0.650 | 0.580 | 0.357 | 0 |

(Express all values to 3 decimal places)