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University Examinations 2013/2014

SECOND YEAR, SECOND SEMESTER EXAMINATION FOR DIPLOMA IN CIVIL ENGINEERING

ECV 0232: ENGINEERING HYDROLOGY

DATE: APRIL 2014   **TIME: 1 ½ HOURS**

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

QUESTION ONE – (30 MARKS)

(a) Define the term hydrology.   (2 Marks)

(b) Define the term precipitation.   (2 Marks)

(c) Determine the optimum number of rain gauges in a basin from the following data so as to limit the percentage error within 10%.
Existing stations = 5No.
Average rainfall at stations = 90, 80, 54, 45, 41cm.   (5 Marks)

(d) State four methods of measuring velocity using a current meter.   (4 Marks)

(e) State two advantages and two disadvantages of recording rain gauges.   (4 Marks)

(f) State three types of recording rain gauges.   (3 Marks)

(g) The annual average rainfall of four stations A, B, C and D in an area is 105, 122, 95 and 102cm respectively. In a particular year station C did not function and the rainfall figures of A, B and D were 90, 97 and 82cm respectively. Compute the missing precipitation at C.   (5 Marks)

(h) State any three types of precipitation.   (3 Marks)

(i) State any two factors considered when selecting a rain gauge site.   (2 Marks)

QUESTION TWO – (15 MARKS)

Using the information given below, calculate the mean rainfall over the area. Show your work clearly.   (15 Marks)

Steps between Isohyets (cm)	Area (km^2)
127.0 – 139.7	181
139.7 – 152.4	388
152.4 – 165.1	337
165.1 – 177.8	311
177.8 – 190.5	104
190.5 – 203.2	26

QUESTION THREE – (15 MARKS)

(a) The annual rainfalls at 7 rain gauge stations in a basin are 58, 94, 60, 45, 20, 88 and 68cm 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)

(b) The normal rainfalls at stations A, B, C and D in a basin are 809.7mm, 675.9mm, 762.8mm and 920.1mm respectively. In the year 1755 the station D was not in operation and the stations A, B and C recorded annual precipitations of 911.1mm, 722.3mm and 798.9mm 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