EMBU UNIVERSITY COLLEGE

(A CONSTITUENT COLLEGE OF THE UNIVERSITY OF NAIROBI)

TRIMESTER EXAMINATION 2013/2014

SECOND YEAR EXAMINATION FOR THE DEGREE OF BACHELOR OF SCIENCE IN WATER RESOURCES MANAGEMENT AND BACHELOR OF SCIENCE IN MANAGEMENT OF AGROECOSYSTEMS AND ENVIRONMENT

AEM 201: ENVIRONMENTAL HYDROLOGY

DATE: AUGUST 11, 2014 **TIME: 11.00AM – 1.00PM**

INSTRUCTIONS:

Answer Question ONE and ANY Other TWO Questions.

QUESTION ONE

a) Explain what hydrology is. (2 marks)

b) What volume is represented by 57 mm of runoff depth from a basin of area 3300 km^2? Give the answer in m^3, cumec-days, ha-m and million cubic metres. (4 marks)

c) Describe briefly the use of hydrograph analysis (4 marks)

d) Describe two methods commonly used to estimate runoff from a catchment. (4 marks)

e) Distinguish between wind and air current? (2 marks)

f) With illustrations, describe what a hydrograph is and explain how it works? (2 marks)

g) Explain how time of concentration is determined using the Kirpich formula. (5 marks)

h) Describe three methods by which sediment may be carried in rivers. (4 marks)

i) What is an 'air mass' as used in environmental hydrology? (3 marks)

QUESTION TWO

a) Describe how the Slope-Area Method is used to measure streamflow discharge (15 marks)

b) A salt with a concentration of 20 mg/cc is introduced into a stream, with no trace initially, at a constant rate of 2 litres per minute. The samples collected at a downstream section sufficiently far away indicated an equilibrium salt concentration of 0.05 ppm. Determine the discharge in the stream from this data. (5 marks)

QUESTION THREE

a) Explain the points considered when locating a stream gauging station. (8 marks)

b) The following data pertain to streamflow in a river at a given gauge station. The rate of rise in water surface elevation = 10.0 cm/h, the normal discharge for the river stage obtained from the steady flow rating curve = 150 m^3/s, slope of the river bed = 3×10^{-4}. If the velocity of the flood wave is 2.5 cm/sec, compute the river discharge. (12 marks)

QUESTION FOUR

a) The mean daily flows at a gauging station for a period of 7 days are 7, 27, 58, 41, 31, 20 and 13 m^3/s respectively. What is the total volume of streamflow at the site in cumec-days? and in hectare-metres? What is the mean flow rate for the week? If the drainage area at the site is 100 km^2, what is the runoff volume in cm? (10 marks)

b) A drainage basin has an area of 210 km^2. The average depth of rainfall received by it during a monsoon period is computed as 65 cm, while the runoff measured at its outlet during the same period is estimated to be 5.68×10^7 m^3. Compute the depth of runoff. What percentage of rainfall has become runoff? If all this runoff volume is stored and used to irrigate a crop which requires 60 cm of water, how many hectares can be irrigated? (10 marks)

QUESTION FIVE

a) Discuss briefly the catchment factors that affect runoff in an area. (12 marks)

b) Describe the process of precipitation formation. (8 marks)

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