



# EMBU UNIVERSITY COLLEGE

(A Constituent College of the University of Nairobi)

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2015/2016 ACADEMIC YEAR

SECOND SEMESTER EXAMINATION

SECOND YEAR EXAMINATION FOR THE DEGREE BACHELOR OF SCIENCE  
(WATER RESOURCES MANAGEMENT)

AEM 201: ENVIRONMENTAL HYDROLOGY

DATE: APRIL 12, 2016

TIME: 11:00-1:00

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**INSTRUCTIONS:**

Answer Question ONE and ANY Other TWO Questions

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**QUESTION ONE**

- a) Outline FIVE goals of environmentalism as used in environmental hydrology. (5 Marks)
- b) State FOUR limitations of the Unit Hydrograph Theory used in hydrology studies. (4 Marks)
- c) State the factors considered when sediment is used as a criterion for the selection of the most appropriate sediment sampler at an observed stream stage. (4 Marks)
- d) An anemometer 10 m above the ground recorded a wind velocity of 1.5 m/s. What is the estimated wind velocity at 2 m above the surface? (3 Marks)
- e) Outline three uses of Digital Elevation Models in the study of environmental hydrology. (3 Marks)
- f) Explain the concept of '*colioris effect*' as used in general circulation of the earth. (5 Marks)
- g) Explain how the Collin's Method is used to derive the unit hydrograph from a complex storm. (6 Marks)

## QUESTION TWO

- a) Explain the concept of triple cell as used in environmental hydrology. (12 Marks)
- b) Describe 'air mass' as a transitory system in studying environmental hydrology. (8 Marks)

## QUESTION THREE

- a) Illustrate how the 'airline' and 'wetline' corrections are made in determining streamflow using the Area-Velocity Method. (12 Marks)
- b) Into a stream, with no trace of salt initially, a salt with a concentration of 20 mg/cc is introduced 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. (8 Marks)

## QUESTION FOUR

- a) Using an illustration, describe the components of the water cycle. (12 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 =  $150 \text{ m}^3/\text{s}$  and the slope of the river bed =  $3 \times 10^{-4}$ . Assuming the velocity of the flood wave to be 2.5 cm/sec, compute the river discharge. (8 Marks)

## QUESTION FIVE

The stage in the river is measured from 00 hours to 24 hours at a uniform interval of 2 hours and the recorded values in meters are: 2.85, 2.80, 3.60, 4.75, 4.80, 6.20, 5.40, 6.10, 4.95, 4.35, 3.75, 3.25 and 3.00. The rating curve of this gauging site is given by  $Q = 23(y-2.5)^{1.75}$ , where Q is in  $\text{m}^3/\text{s}$  and y is the stage in metres.

- a) Plot the given stage hydrograph and the corresponding discharge hydrograph. (10 Marks)

b) Find:

- i) The peak discharge ( 3 Marks)
- ii) The volume of streamflow represented by the hydrograph in million  $m^3$ . (5 Marks)
- iii) The mean flow for the day. (2 Marks)

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