THE MOMBASA POLYTECHNIC UNIVERSITY COLLEGE

(A Constituent College of JKUAT)
Faculty of Engineering and Technology

DEPARTMENT OF BUILDING AND CIVIL ENGINEERING

UNIVERSITY EXAMINATION FOR DEGREE IN BACHELOR OF SCIENCE IN CIVIL ENGINEERING

ECE 2313: PUBLIC HEALTH ENGINEERING II

END OF SEMESTER EXAMINATION

SERIES: DECEMBER 2011
TIME: 2 HOURS

Instructions to Candidates:
You should have the following for this examination
- *Answer booklet*

This paper consists of **FIVE** questions
Answer question **ONE (COMPULSORY)** from **SECTION A** and any other **TWO** questions from **SECTION B**
Maximum marks for each part of a question are clearly shown
This paper consists of **THREE** printed pages

SECTION A (COMPULSORY)

Question 1 (30 marks)

a) Discuss the factors that affect transmission of diseases (6 marks)

b) Discuss the **FOUR** main water borne diseases (8 marks)

c) Make short notes on the following:
   (i) Total suspended solids (TSS)
   (ii) Chemical Oxygen Demand (COD)
   (iii) Biochemical Oxygen Demand (BOD)
   (iv) Turbidity (8 marks)

d) BOD tests were conducted on composited samples of raw wastewater and treated after chlorination. The tests were set up by pipetting 5.0ml into each 300 – ml bottle. For one pair of bottle, the results were as follows:

(i) The initial dissolved oxygen (DO) was 8.4mg/l and after five days of incubation at 20°C., the final DO was 3.7mg/l. Calculate the BOD_5 and estimate a 20-day BOD value assuming a k of 0.10 day^{-1}. Assume on BOD is associated with dilution water (4 marks)

(ii) The treated wastewater sample was dechlorinated prior to conducting a seeded test. The BOD bottles were set up with 50.0 ml of treated wastewater and 0.5ml of raw wastewater for seed added to each bottle. For one pair of bottles, the test results were as follows: The initial DO was 7.6mg/l, and the final DO was 2.9mg/l. Calculate the BOD (4 marks)

SECTION B (Answer any TWO questions from this section)

Question 2 (20 marks)

a) Discuss the major components that are important in water quality testing (6 marks)

b) Briefly explain **TWO** types of sewerage systems (4 marks)

c) With an aid of a graph, explain the term batch bacteria culture (5 marks)

d) What do you understand by the term first order kinetics (5 marks)

Question 3 (20 marks)

a) Define bacterial water analysis. Discuss any **FOUR** methods of bacterial water analysis (10 marks)

b) What are the applications of COD and BOD testing? (10 marks)

Question 4 (20 marks)

a) Differentiate between total solids and dissolved solids (4 marks)

b) Discuss the standard method of determining total suspended solids (16 marks)

Question 5 (20 marks)

a) A BOD test was done on a 5mL sample. The initial DO of the sample and dilution water was 7.82mg/L. The DO of the sample after 5 days of incubation was 4.17 mg/L. Compute the BOD of the sample (3 marks)

b) (i) Using relevant formula, discuss Chemical Oxygen Demand (COD) (5 marks)

(ii) What are **THREE** main factors determine the standards of receiving water or the sewage disposal systems (3 marks)

c) A municipality has a population of 20,000 inhabitants. Given the following data, compute the Population equivalent of the municipality including the brewery wastewater. The data given include:

- W_{BOD} = 54G/capacity/person/day
- 30m^3 of beer per day
- 15 m^3 beer per day
- 15m^3 of wastewater/m^3 beer
- 600g BOD_5/m^3 wastewater (3 marks)