THE MOMBASA POLYTECHNIC UNIVERSITY COLLEGE

University Examination 2010

THIRD YEAR/FIRST SEMESTER EXAMINATION
FOR THE DEGREE IN BACHELOR OF SCIENCE IN CIVIL ENGINEERING
SUPPLEMENTARY PAPER

ECE 2305: PUBLIC HEALTH ENGINEERING

SERIES: APRIL/MAY 2010 **TIME:** 2 HOURS

Instructions:

Answer Question **ONE** and any other **TWO** questions.

QUESTION ONE

(a) By use of a simplified diagram, illustrate the concept of the hydrologic water cycle. (10 marks)

(b) State the mass balance equation for the water budget. (6 marks)

(c) Define the following terms:

(i) Aquifer
(ii) Safe yield of an aquifer. (4 marks)

(d) Describe the logical methodology to determine whether the groundwater flow in an aquifer is laminar or not. (10 marks)

QUESTION TWO

(a) Name (scientific name) of 2 common forms of chlorine solutions used for water disinfection. (10 marks)

(b) Calculate the batch strength (mg/l) of 20g of ordinary bleaching powder of 32% strength dissolved in 15 litres of water. (4 marks)

(c) Define the following terms:

(i) BOD_5
(ii) Free chlorine
(iii) COD
(iv) Turbidity
(v) Alkalinity
(vi) Hardness (12 marks)

QUESTION THREE

(a) A community's population is estimated to be 35,000 20 years from now (2010). The present population (2010) is 28,000 and the present average water consumption is 16,000 m^3/day. The existing water treatment plant has a design capacity of 19,000 m^3/day. (Assuming an arithmetic rate of population growth (i.e $P_t=P_o+K_t$).
Determine the year that the plant will reach design capacity. (14 marks)

(b) State the term Reynolds Number and define all the parameters. (6 marks)

QUESTION FOUR

(a) State the following formulae defining all the parameters:

(i) Darcy-Weisbach Formula
(ii) Hazen-Williams Formula. (6 marks)

(b) A fluid has an absolute viscosity of 0.48 Kg/m/s and a specific gravity of 1.15. The fluid is pumped at a rate of 3.78 litres/min through a pipe 15.25m long of diameter 15.8mm. Calculate the frictional head loss given that the flow is laminar and can be described by:

$$f = 64/Re$$

where

f = frictional coefficient
Re = Reynolds number. (14 marks)