TECHNICAL UNIVERSITY OF MOMBASA

FACULTY OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF BUILDING & CIVIL ENGINEERING

UNIVERSITY EXAMINATION FOR:

BACHELOR OF SCIENCE IN CIVIL ENGINEERING
(INSTITUTION BASED EXAMINATION)

ECE 2305 : PUBLIC HEALTH ENGINEERING I

END OF SEMESTER EXAMINATION

SERIES: MARCH 2017

TIME: 2 HOURS

DATE: 31st Mar 2017

Instructions to Candidates
You should have the following for this examination
   -Answer Booklet, examination pass and student ID
This paper consists of five questions.
Attempt question ONE (Compulsory) and any other TWO questions.
Do not write on the question paper.

QUESTION ONE (COMPULSORY)

a) Briefly describe the hydrologic cycle.   (6marks)
b) For a water supply project, outline SIX factors that influence the per capita water
   demand.   (6marks)
c) The population of a town was 42000 in 2002 and 47000 in 2012. Using the compound
   interest formula, calculate the projected population for the year: (6marks)
      i) 2022
      ii) 2042

d) Explain TWO reasons for screening water at the intake. (2marks)
e) Compare the following sources of water;
      i) Surface water from rivers
      ii) Ground water from boreholes
      iii) Rainwater from roof catchments (10marks)

Attempt any TWO questions

QUESTION TWO

a) Outline FOUR factors considered in selecting an intake site for a surface water source. (6marks)
b) Sketch an intake, suitable for abstracting water at multiple depths. (6marks)
c) Outline TWO methods of silt removal from an intake. (4marks)
d) State FOUR quality requirements for domestic water. (4marks)

QUESTION THREE

a) A water supply is to have the following components;

- A river intake (pumped)
- Aeration
- Filter
- High lift pumps
- Screens
- Chemical dosing plant for coagulants
- Low lift pumps
- Clarifiers
- Disinfection plant
- preliminary settling tanks
- flocculators
- Elevated tank for clear water

    i)   Arrange the components in the correct sequence, starting from the first
    ii)   Mention the reason a component appears before another one

    (12marks)

b) Briefly describe the following water treatment processes;

    i) Sedimentation
    ii) Aeration

    (8marks)

QUESTION FOUR

a) Briefly describe the following tests for water
      i) Jar test
      ii) Total coliform test

   (12marks)

b) Explain the procedure of determining the following from a water sample;
      i) Dissolved solids
      ii) Suspended solid
      iii) Total solids

   (6marks)

c) Outline the importance of determining the acidity of water and waste water. (2marks)

QUESTION FIVE

a) Design a rectangular sedimentation tank to treat 2.4 million litres of raw water per day. Make the following assumptions;
   - Depth of the tank is 3m
   - Length: Breadth ratio is 3

   Also calculate the surface loading in $l/d/m^2$

   (6marks)

b) Explain the TWO major reasons of providing storage tanks in the water distribution systems. (4marks)

   (i) Explain the use of the following in a water distribution system;
      i. Air valve
      ii. Wash out valve

   (ii) State the position of the valves in Q5c (i) in relation to the elevation of a pipeline. (6marks)

c) Explain TWO major differences between a "Rapid sand filter" and a "Slow sand filter". (4marks)