TECHNICAL UNIVERSITY OF MOMBASA

Faculty of Engineering & Technology

DEPARTMENT OF BUILDING & CIVIL ENGINEERING

UNIVERSITY EXAMINATION FOR:
BACHELOR OF SCIENCE IN CIVIL ENGINEERING

ECE 2305: PUBLIC HEALTH ENGINEERING I

END OF SEMESTER EXAMINATION
SERIES: DECEMBER 2013
TIME ALLOWED: 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)** and any **TWO** questions
Maximum marks for each part of a question are as shown
This paper consists of **THREE** printed pages

Question One (Compulsory)

a) Explain with the aid of a diagram the hydrologic cycle. **(5marks)**

b) Discuss the merits and demerits of rain water from quality point of view. **(5 marks)**

c) With the aid of a sketch, describe the formation of the following:
   (i) Gravity spring
   (ii) Artesian spring **(6 marks)**

d) The hourly water consumption of a town is given in the table below:

ime in Hours	Water consumption m^3/hr	Time in hours	Water consumption m^3/hr
0.00	0	13.00	263
1.00	108	14.00	259
2.00	97	15.00	263
3.00	90	16.00	263
4.00	79	17.00	274
5.00	76	18.00	299
6.00	104	19.00	364
7.00	158	20.00	336
8.00	212	21.00	212
9.00	248	22.00	148
10.00	262	23.00	140
11.00	284	24.00	112
12.00	270		

Determine:
   (i) The constant 24 hour pumping rate
   (ii) The required storage capacity to equalize demand over a 24 hour period

(14 marks)

Question Two

a) Describe the general requirements of a distribution system **(5 marks)**

b) Describe the dead end layout of water distribution system and state its two advantages and two disadvantages. **(5 marks)**

c) Describe the grid iron layout of water distribution system and state its two advantages and two disadvantages **(5 marks)**

d) Explain the intermittent system of water supply and its drawbacks **(5 marks)**

Question Three

a) State FIVE objectives to be achieved through purification of water **(5 marks)**

b) Describe the clearing of slow sand filter **(5 marks)**

c) Describe the clearing of rapid sand filter **(5 marks)**

d) Two sedimentation basis area 30m in diameter with 2.4m side water depth. Single weirs are located on the peripheries of the tanks. For a water flow of 35,000m^3/d, calculate:

(i) The overflow rate
(ii) Detention time
(iii) Weir loading **(5 marks)**

Question Four

a) Discuss the causes of the following parameters in raw water:

(i) Turbidity
(ii) Taste and odour
(iii) Colour **(6 marks)**

b) Describe the effects of the following chemical impurities found in raw water:

(i) Iron and manganese
(ii) Fluorides and iodides
(iii) Sodium and potassium **(6 marks)**

c) Describe a jar test for determining the optimum coagulant dose. **(6 marks)**

d) What is bio-chemical oxygen demand? **(2 marks)**

Question Five

a) Briefly explain why and where the following are used in water rains:

(i) Air values
(ii) Wash outs
(iii) Check values **(6 marks)**

b) Describe the functions of storage and distribution reservoirs **(4 marks)**

c) Describe the factors which affect coagulation **(4 marks)**

d) Calculate the size of a rectangular tank to treat 1,800m^3/d of water. The detention period may be assumed as 4 hours and overflow rate less than 50m^3/m^2/d. Take the total depth of water as 4.2m **(6 marks)**