TECHNICAL UNIVERSITY OF MOMBASA

Faculty of Engineering & Technology

DEPARTMENT OF BUILDING & CIVIL ENGINEERING

UNIVERSITY EXAMINATION FOR DECREE IN:

BACHELOR OF SCIENCE IN CIVIL ENGINEERING (BSCE)

ECE 2512: PUBLIC HEALTH ENGINEERING IV

END OF SEMESTER EXAMINATION
SERIES: APRIL 2015
TIME ALLOWED: 2 HOURS

Instructions to Candidates:
You should have the following for this examination
- *Answer Booklet*
- *Pocket Calculator*

This paper consists of **FIVE** questions. Answer question **ONE (COMPULSORY)** and any other **TWO** questions
Maximum marks for each part of a question are as shown
Use neat, large and well labeled diagrams where required
This paper consists of **TWO** printed pages

Question One (Compulsory)

a) Define the following terms;
- **(i)** Maximum Dry Weather Flow Rate (Q_d) **(2 marks)**
- **(ii)** Maximum wet wealth flow rate (Q_w) **(2 marks)**

b) Thika town with a population of 20,000 people has an area of 1400 hectares of which 200 hectares are zoned commercial and 200 hectares zoned industrial. The average water consumption is 150lpd and 70% of this water reaches the sewers. On the basis of sewer gauging the average flow from the commercial area is 3,000,000l/day. The peaking factor for commercial, domestic, industrial and infiltration/inflow area 1.75, 3.1, 1.8 and 1.6 respectively. Using industrial and infiltration/inflow allowances of 5000l/hectares/day and 570l/ha/day, determine:
- **(i)** Average wastewater flow
- **(ii)** Peak waste water flow rate
- **(iii)** Overall peaking factor **(12 marks)**

c) Discuss procedures followed during economic analysis of a water supply system **(4 marks)**

Question Two

a) Design a primary sedimentation tank of rectangular shape for Ukunda town having a population of 40,000 people with a water supply of 150 litres per capita per day. Assume a detention period of 2 hours and that 80% of water supplied to the town is converted in to sewage **(10 marks)**

b) Briefly discuss the criteria needed for the formulation for the design of sewer systems **(9 marks)**

c) Define the term infiltration **(1 mark)**

Question Three

a) Outline the procedure for Urban drainage design **(10 marks)**

b) Design a coagulation sedimentation tank with a continuous flow for treating water for a population of 60,000 persons with an average daily consumption of 150 litres/person. Assume a surface loading rate of $0.9 m^3 m^{-2} h^{-1}$ and that the weir loading rate is within the acceptable limits **(10 marks)**

Question Four

a) Design a sedimentation tank for a flow (Q) of 24000m3/day. Determine the dimensions of the tank and the outflow weir length. Assume suitable design criteria **(12 marks)**

b) Briefly discuss the procedures for preparation of project and economic analysis **(8 marks)**

Question Five

a) How do you control odour in maturation ponds? **(6 marks)**

b) Given the following data of Thika town:

- Population of 40,000 persons
- Water consumption of 100l/person/day
- Temperature of 20°C

Determine:

(i) Mid.depth area of the facultative and associated maturation pond **(1 mark)**
(ii) Retention time **(1 mark)**
(iii) Organic loading **(1 mark)**
(iv) Bacterial quality of final effluent **(1 mark)**

c) A 40 hectares drainage basin containing 24 hectares net residential area with average of 5 dwelling units per hectares zoned commercial area. Determine the design flow for a sewer servicing this area.

- Residential = 200l/person/day
- Commercial = 18000l/hectare/day
- Peak I and I allowance of 9000 y/h/day **(5 marks)**

d) What are the main objectives for screening in wastewater **(5 marks)**