TECHNICAL UNIVERSITY OF MOMBASA

FACULTY OF ENGINEERING AND 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 2016

TIME: 2 HOURS

DATE: 15 Dec 2016

Instructions to Candidates

You should have the following for this examination

-Answer Booklet, examination pass and student ID

-Drawing instruments.

This paper consists of four questions.

Answer question ONE (Compulsory) and any other TWO questions.

Do not write on the question paper.

QUESTION 1:

a) Define the following terms as used in water supply engineering:
    1) Runoff coefficient
    2) Confined aquifer
    3) Impounded reservoir
    4) Yield of a well

(8 Marks)

b) What are the factors which affect the amount of runoff from a catchment area? **(5 Marks)**
c) State five waterborne diseases and the pathogenic bacteria/microorganism causing each of the diseases mentioned. **(5 Marks)**
d) What are the factors which affect water consumption per capita? **(6 Marks)**
e) Differentiate between surface and groundwater sources. **(2 Marks)**
f) A town in Kenya is experiencing chronic water shortages which have affected most businesses including institutions. One of the national secondary school in the town is contemplating putting up its own water supply. If the school has a student population of 1200 boarding in the school, calculate its water demand by students. Use the table provided for water consumption rates. **(4 Marks)**

QUESTION 2:

a) What is portable water? **(4 Marks).**
b) List the broad classification of impurities in water. **(4 Marks)**
c) Give the maximum allowable limit of two inorganic impurities in drinking water and state the possible source of these impurities. **(4 Marks)**
d) What is the difference between sterilization and disinfection? **(4 Marks)**
e) What do you understand by impurities in drinking water with "health significance" and "aesthetic significance" as used in water quality assessment? **(4 Marks)**

QUESTION 3:

a) Explain the following terms using neat sketches where applicable.
    i. Spring
    ii. Shallow well
    iii. Mass curve

(6 Marks)

b) Differentiate between infiltration gallery and infiltration well. **(2 Marks)**
c) Surface water is usually subjected to full treatment before it supplied to the public for various uses. Outline the processes stating their purpose in full treatment of water for public supply. **(4 Marks)**

d) Design rapid sand filters for a town with a population of 60,000people. The filter works for 12 hours a day. Assume average consumption rate of 120l/h/d and a filtration rate of 5.0 $m^3/h/m^2$. **(8 Marks)**

QUESTION 4:

a) Explain the function of the following components in a water distribution network:
   i. Transmission mains
   ii. Distribution mains
   iii. Service reservoirs
   iv. Water distribution system.

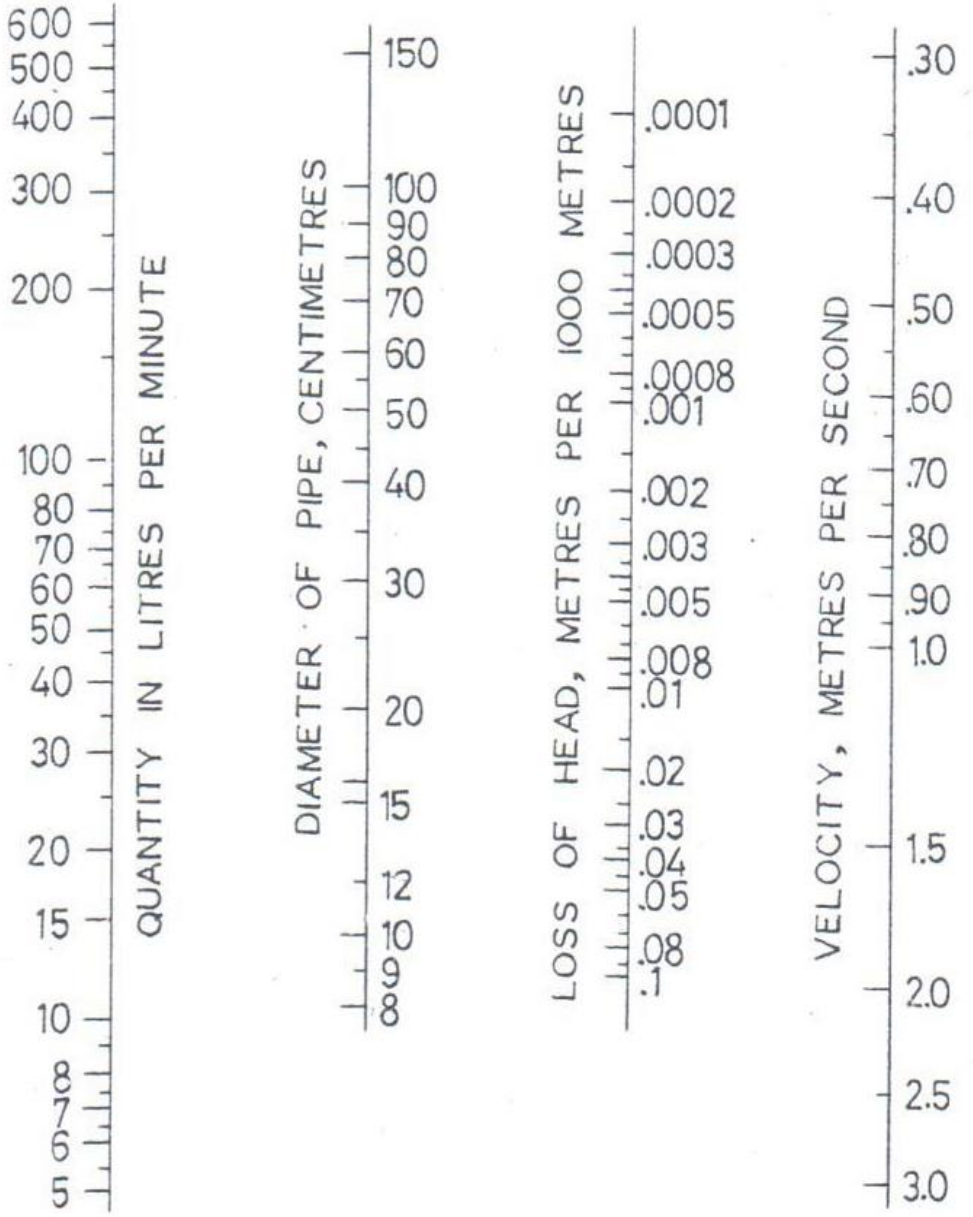
(8 marks)

b) In a water supply scheme water is conveyed from the source to the treatment works and onward to the distribution system before it reaches the consumers. More often than not the water is conveyed in pipes. Various materials are used in the manufacture of pipes for this purpose. List four types of materials used to manufacture pipes. **(4 marks)**

c) uPVC pipes are widely used in Kenya for conveyance of water. List four classes of uPVC pipes and the corresponding maximum pressures they can withstand. **(2 Marks)**

d) A water pipe has a diameter of 60cm and water flows in it at a velocity of 0.9m/s. The Hazen-William's coefficient C, of the pipe is 100. Using the nomogram based on Hazen-William's formula provided, determine the following:
   i. The flow in the pipe in litres per minute
   ii. The slope of the pipe.

(6 marks)



Nomogram based on Hazen-William's formula ($C=100$)