DEDAN KIMATHI UNIVERSITY OF TECHNOLOGY

UNIVERSITY EXAMINATIONS 2020/2021 ACADEMIC YEAR

THIRD YEAR FIRST SEMESTER EXAMINATIONS FOR THE DEGREE OF BACHELOR OF SCIENCE IN CIVIL ENGINEERING &

BACHELOR OF EDUCATION TECHNOLOGY IN CIVIL ENGINEERING

ECE 3105: PUBLIC HEALTH ENGINEERING I

DATE: 27TH SEPTEMBER 2021 **TIME: 8:30-10:30AM**

INSTRUCTIONS TO CANDIDATES:

(a) This paper contains FOUR (4) questions.

(b) You are required to answer QUESTION (1) and ANY OTHER TWO (2) questions.

QUESTION 1 (30 MARKS) – Compulsory

a.) State any three roles of public health engineering in the society. (3 marks)

b.) State four factors that determine the design period for a water treatment and supply system. (4 marks)

c.) Differentiate between potable and palatable water. (2 marks)

d.) State four reasons why ground water is often a preferred water source? (4 marks)

e.) State three negative impacts of having dissolved solids in drinking water. (3 marks)

f.) The choice of a water treatment system depends on the source of the raw water. Identify the type of system that is suitable for treatment of ground water, and in an appropriate sketch state the treatment units/processes in that system. (4 marks)

g.) With relevant examples, briefly describe the point and non-point sources of surface water pollution. (4 marks)

h.) State the impacts of depositing excessive quantities of suspended solids into surface water bodies. (4 marks)

i.) Differentiate between pumped storage and clearwell storage. (2 marks)

QUESTION 2 (20 MARKS)

a.) Explain the difference between the true and apparent color of water? (2 marks)

b.) State and explain five factors considered when locating water intake facilities for water treatment plants. (10marks)

c.) Water distribution systems require valves for various operations. Briefly describe four special purpose valves, based on the role they play. (8 marks)

QUESTION 3 (20 MARKS)

a.) List three materials that cause turbidity in each of the following:

(i)surface water (ii) household and industrial wastewaters. (3 marks)

b.) A river water sample collected at the downstream of a wastewater effluent discharge point is found to have a standard BOD of 0.15g/L, measured on day 5 at 20°c. Determine the BOD of the same sample measured at day 8 at 15°c. Use a temperature coefficient of 1.047 and a reaction rate constant of 0.23 per day. (7 marks)

c.) Briefly describe five factors that influence the demand for water in a community. (10 marks)

QUESTION 4 (20 MARKS)

a.) Based on their sources, differentiate between surface water and ground water. (2 marks)

b.) State four disinfectants and briefly explain the mechanisms by which they inactivate or kill microorganisms in water treatment. (8 marks)

c.) A representative sprinkler plus hose-stream fire flow is desired for a motel district. Given that the area of a representative motel is 1,500 m^2, four compartments are used for the sprinkler system and that the motels are classified as Ordinary group 1 hazard group, estimate the fire flow for a sprinkler system and a hose-stream in the motel district. (10 marks)S

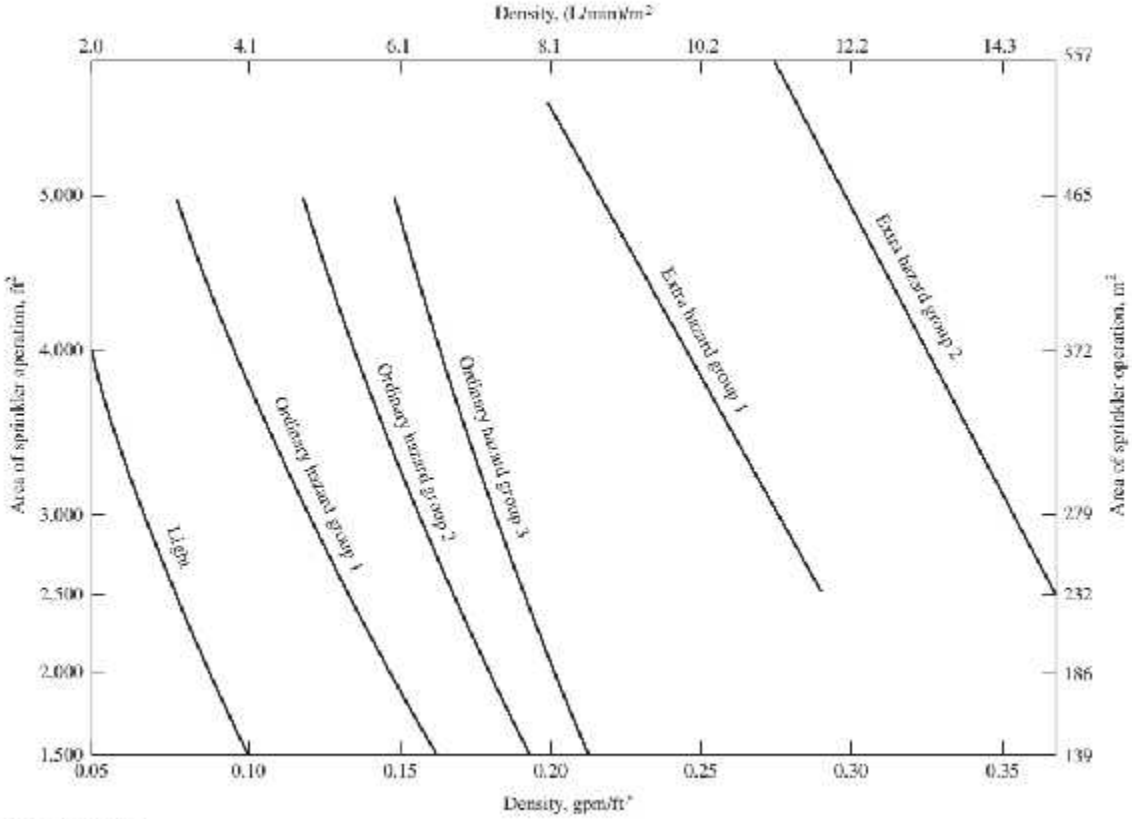

FIGURE 17-1
Sprinkler system design curves. Reprinted with permission from NFPA, 13-1987.

TABLE 17-2
Hazard classification schedule for hose-stream allowance

Hazard classification	Hose-stream allowance, m^3/min	Duration, min
Light	3.8	30
Ordinary group 1	9.5	60–90
Ordinary group 2	9.5	60–90
Ordinary group 3	19	60–120
Extra hazard group 1	19	90–120
Extra hazard group 2	38	120