DEDAN KIMATHI UNIVERSITY OF TECHNOLOGY
UNIVERSITY EXAMINATIONS 2020/2021 ACADEMIC YEAR
THIRD YEAR SECOND/FOURTH YEAR FIRST SEMESTER EXAMINATION FOR THE DEGREE OF BACHELOR OF TECHNOLOGY IN BUILDING CONSTRUCTION

TBD 3105: BUILDING SERVICES AND CONTROL SYSTEMS

DATE: 28TH SEPTEMBER **TIME: 8:30-10:30AM**

INSTRUCTIONS TO CANDIDATES

- This paper contains **FIVE (5)** questions
- Attempt any **FOUR (4)** questions
- **ALL** questions carry equal marks
- Use a scientific non-programmable calculator
- Erasers and pencils will be required
- Graph papers will be provided
- **ALL** workings should be shown on the provided answer booklets
- Cell phones are **NOT** allowed in the examination room.

QUESTION ONE (1)

a) State four factors that are considered in choosing illumination levels for a particular task

(4 Marks)

b) Calculate the sizes of eaves gutter and vertical rain water pipes required to drain a roof 50m long by 15m wide (ridge to eaves) roof pitch 30°, given that the intensity of rainfall experienced is 75mm/hr and a level half-round gutter is preferred. Sketch a possible layout of the of the gutters and the down pipes (Use **Table 1.b-i** and **Table 1.b-ii** In selecting gutter and rainwater pipe sizes) **(12 Marks)**

Gutter Size (mm)	Flow capacity
75	0.4
100	0.8
115	1.1
125	1.5
150	2.3

Table 1.b-i Flow capacities for half-round gutters

Gutter Size (mm)	Outlet at one end of gutter	Outlet not at one end of gutter
75	50	50
100	50	50
115	50	63
125	63	75
150	75	100

Table 1.b-ii Minimum vertical rainwater pipe sizes for round cornered outlets

c) List and differentiate between the three popular underground drainage systems **(9 Marks)**

QUESTION TWO (2)

a) Discuss the factors considered in the design and location of a high-rise office building with respect to safety of occupants in the event of fire outbreak. **(15 Marks)**

b) A foul water private sewer is to serve a residential development expected to accommodate 100 households. It is assumed that each house in the estate will be occupied by 5 people and the average daily water consumption per head is 200 litres. The sewer is to be sized so that it runs half-full bore, at a velocity of 0.8 m/s during the peak demand period. It is estimated that half the discharge occurs during a five hour peak period. Calculate the optimal pipe diameter to convey the wastewater at all times **(10Marks)**

QUESTION THREE (3)

a) State the three reactions that may occur when noise is produced within a building and outline the design and construction precautions that should be considered in order to control the noise in buildings **(10 Marks)**

b) A design office of dimensions 15m x 10m x 3m high has a white ceiling and light coloured walls with reflection factor of 70% and 50% respectively. The working plane is 1m above the floor level. 70W fluorescent lighting fittings with a rated output of 5000lm are proposed for use. If the illumination level is 400lx, determine the number of fittings required

- The fluorescent tube is enclosed in a plastic diffuser with a basic downward LOR of 50%
- The fluorescent tubes will operate under normal atmospheric conditions with a maintenance factor of 0.8 **(10 Marks)**

c) Discuss the main comfort criteria in buildings **(5 Marks)**

QUESTION FOUR (4)

a) The main purpose of landscaping is to improve the outside environ met so that it is in harmony with the interior environment. In order to achieve this, which six factors have to be considered? **(6 marks)**

b) Outline the normal progress of fire, sometimes referred to as the wave of fire **(10 Marks)**

c) Discuss the main safety precautions that should be taken to ensure that electricity supply to a building construction site does not cause any hazards during the construction period

(9 Marks)

QUESTION FIVE (5)

a) What do you understand by the term 'ventilation'? explain the principles of operation of the following mechanical systems of ventilation:

i. Natural inlet and mechanical extract

ii. Mechanical inlet and natural extract

iii. Mechanical inlet and extract

(12 Marks)

b) There are two methods of supplying cold water to buildings. Differentiate between these two and state three merits of each method. **(13 Marks)**