



**NATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY**

**FACULTY OF THE BUILT ENVIRONMENT**

**DEPARTMENT OF QUANTITY SURVEYING**

**BCM 2102**

**BUILDING SERVICES & SYSTEMS I**

**Supplementary Examination Paper**

**August 2024**

This examination paper consists of 3 pages

**Time Allowed:** 3 hours  
**Total Marks:** 100  
**Examiner's Name:** H. Wilson

**INSTRUCTIONS**

- 1. Answer question 1 and any other 3 questions*
- 2. Use of calculators is permissible*

**MARK ALLOCATION**

<b>QUESTION</b>	<b>MARKS</b>
1.	25
2.	25
3.	25
4.	25
5.	25
<b>TOTAL</b>	<b>100</b>

**QUESTION 1 (COMPULSORY)**

- a) Explain the terms 'temporary' and 'permanent' hardness of water and list the characteristics of that water. [5]
- b) Calculate the gradient required for a 350mm diameter surface water sewer when flowing half full bore at a velocity of 0.8m/s. [15]
- c) What factors does one have to consider when buying the most appropriate generator for use as an emergency electricity supply source for a Broadcasting station [5]

**QUESTION 2**

- a) A classroom 12m x 8m x3m requires an illumination level of 500 Lux on the working tables. It is proposed to use 80W fluorescent fittings having a rated output of 7375 lumens each. Assuming a UF of 0.7 and a MF of 0.8, design the lighting system. [15]
- b) Identify and illustrate the following electrical symbols you would find on an electrical drawing that would be used for the installations for a Banking Hall Design.
  - i. Switch (both open and closed)
  - ii. Socket
  - iii. Light/bulb
  - iv. Cell
  - v. Ground [10]

**QUESTION 3**

- a) A proposed building is to have 25 storeys. It is still undergoing a feasibility study and has been discovered that the water mains pressure will not be adequate to supply upper floors. As part of the team carrying out the study, advise with the aid of clear sketches, on how the cold water can be supplied to such a building. [25]

#### QUESTION 4

Compare and contrast firefighting using a sprinkler system to that of a mulsifyre system [25]

#### QUESTION 5

- a. List the 3 categories of lifts. [3]
- b. Outline at least 7 factors to consider when planning lifts inside a multi-story structure. [7]
- c. A group of 5 lift cars, each having a carrying capacity of 15 persons and a car speed of 2m/s is specified for a 16 storey office block with a floor pitch of 3m. The net floor area above the ground floor is 7000m<sup>2</sup>. The population density is 1 person per 10m<sup>2</sup> of the net floor area and the starting time is unified. The clear door width is 1.2m and the door opens at a speed of 0.4m/s. Compute the handling capacity and determine the quality of service for this installation. [15]