



**NATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY**

**FACULTY OF BUILT ENVIRONMENT**

**DEPARTMENT OF ARCHITECTURE**

**BUILDING SERVICES I**

**AAR 3103**

**Examination Paper**

**December 2016**

This examination paper consists of 3 pages

**Time Allowed: 3 hours**

**Total Marks: 100**

**Special Requirements: None**

**Examiner's Name: Muvungani R.**

**INSTRUCTIONS**

1. Answer question **ONE** and any other three questions
2. Each question carries 25 marks
3. Use of calculators is permissible

**MARK ALLOCATION**

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

### QUESTION 1

- a) Justify the application of an alcove arrangement on lifts design? [5]
- b) A group of 4 lift cars, each having a carrying capacity of 16 persons and a car speed of 1.5m/s is specified for a 10 storey office block with a floor pitch of 2.5m. The net floor area above the ground floor is 12 000m<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 round trip time for one car, the handling capacity for the group and determine the quality of service for this installation. [20]

### QUESTION 2

- a) Describe any four cable containing systems that are used to house electric cables in buildings [4]
- b) Distribution of light from luminaires can conveniently be described by a system of numbers. Justify the use of these luminaires in light designing and describe 5 classes of luminaires that are available in the market [7]
- c) A general office of dimensions 16m x 7m x 3.5m is to be illuminated to a design level of 400 lux using 65W fluorescent fittings having a BZ classification of 4 and an installed flux of 5500 lumens per fitting. The working plane of the office is 0,85m. If the utilization factor and the maintenance factors are 0.80 and 0.90 respectively, design a lighting system for the office [14]

### QUESTION 3

- a) Discuss the likely consequences to public users if a legislation to replace conventional electricity water heaters with solar water heaters is enacted [8]
- b) The operational systems of solar water heaters can either be a direct or an indirect system. Compare and contrast the way these two systems operate [12]
- c) Explain measures that can be taken by designers to minimize heat loss in long distributing piping [5]

#### QUESTION 4

- a) Escalators pose one major problem of creating large floor openings, which actually encourage the spread of fire to next floors in an event there is a fire outbreak. Explain design measures that can be followed to address this problem [10]
- b) The administration building of Manunure high school was gutted by fire after a petrol bomb attack at night and management is concerned about installing a fire protection system in the building. Advise on the most suitable system [15]

#### QUESTION 5

- (a) Explain the following terms in relation to water treatment process
- i. Oxidation [2]
  - ii. Coagulation [2]
  - iii. Flocculation [2]
  - iv. Ultraviolet radiation [2]
  - v. Ozonation [2]
  - vi. Fluoridation [2]
- (b) Making use of the table below, calculate the capacity of a cold water storage cistern for a five storey office block which will have a canteen. The population will be 60 persons for each of the first 3 floors and 50 persons for each of the last 2 floors. 10 hours storage of water in case of interruption of supply has been decided. [13]

**Table:** Provision of cold / hot water storage to cover 24 hours interruption of supply.

<i>Type of building</i>	<i>Storage (ltrs)</i>
Hostel	90 per bed space
Hotel	200 per bed space
Offices:	
With canteens	45 per employee
Without canteen	45 per employee
Restaurant	7 per meal
Boarding school	90 per pupil
Children's home	135 per bed space