MURANG'A UNIVERSITY OF TECHNOLOGY

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

UNIVERSITY ORDINARY EXAMINATION

2023/2024 ACADEMIC YEAR

SECOND YEAR **SECOND** SEMESTER EXAMINATION FOR BACHELOR OF TECHNOLOGY IN ELECTRICAL AND ELECTRONICS ENGINEERING

EET 211 – WORKSHOP PRACTICE

DURATION: 2 HOURS

INSTRUCTIONS TO CANDIDATES:

1. Answer question one and any other two questions.
2. Mobile phones are not allowed in the examination room.
3. You are not allowed to write on this examination question paper.

SECTION A: ANSWER ALL QUESTIONS IN THIS SECTION

QUESTION ONE (30 MARKS)

a. Showing the isolation/protective elements right from the service cable from the utility company, draw a single phase-one line power supply diagram for domestic consumer wiring. Indicate circuit breaker current rating, cable size, show supply to; lighting, doorbell, water heater, worker and radial socket outlets. ($3^{1/2}$marks)

b. Draw a well labelled wiring setup (indicating both live and neutral of a single lightning point on the lobby of a building that is to be independently controlled at three different points. (2marks)

c. As an electrician, if you were to measure the earthing resistance of your electrical works and found it to be 400Ω, what does it mean? Comment if you get the same value for insulation resistance. (3marks)

d. State three reasons why MCBs are preferred over fuses in electrical installation. (3marks)

e. State four protection devices/accessories used in electrical installation circuits and mention the hazard/danger against which it protects. (2marks)

f. Define the following terms as applied in illumination engineering. ($2^{1/2}$marks)
   i. Maintenance factor
   ii. Utilization factor
   iii. Room index
   iv. Illuminance
   v. Space height ratio

g. Determine the number of luminaries required for a student laboratory room with dimensions L=20m, W = 40m and H = 8m. Consider that the selected luminaries for installation are to be suspended 1.5m from the ceiling and the working plane is 1m above the floor, also the manufacturers of the luminaire recommend a space height ration of 1:5:1 (2marks)

h. An electrical machines workshop, 30m x 20m is to be illuminated with 2X58W LPMV luminaries. Calculate the number of luminaries required to maintain an average illuminance of 500 lux assuming an initial lamp output of 5,200 lumens with a maintenance factor and utility factor of 0.8 and 0.7 respectively. (2marks)

i. A Vice Chancellor's court reception area 18m x 11m, is to be illuminate by 40 70w, 2 pin pod MBI luminaries. The initial lamp output is 6600/m with and MF and UF of 0.8 and 0.65 respectively. Determine the average illuminance in the reception area as well as the efficacy of the lamp. (4marks)

j. State four advantage of a trunking over a conclavist wiring system. (2marks)

k. Briefly explain the importance of power factor correction in electrical installation works (2marks)

l. Briefly explain the importance of earthing household electrical installations. (2marks)

SECTION B – ANSWER ANY TWO QUESTIONS IN THIS SECTION

QUESTION TWO (20 MARKS)

a. A high rise apartment block has a provision for a lift shaft. The developer intends to install a lift with a cabin capacity of 10 persons with an average weight of 75kg per head with a speed of 72m/min.
   i. Calculate the motor rating of the lift assuming a counter weight factor of 40% and installation efficiency of 0.85. (2marks)
   ii. Appropriately size the MCCB for the lift. (3marks)
   iii. Determine the appropriate cable size to supply the lift using IEE wiring regulation table. Assume a cable length of 70m and installation method B to be adopted. (5marks)

b. State and briefly explain four types of tests conducted on completed electrical installation works for buildings. Mentions how the test is conducted and the instrument used. (10marks)

QUESTION THREE (20 MARKS)

a. A power electronics lab at the upcoming engineering complex with dimension's 24m x 8.6 x 3.0m, is to be illuminated by a single core line battery LED module with a luminous flux of 6400 lumens per tube. The working plane is 0.8m above the floor. The ceiling wall and floor reflectance were taken to be 70%, 50% and 30% respectively.
   i. Calculate the room index. (2marks)
   ii. Determine the utilization factor using the photometric data sheet provides. (2marks)
   iii. Calculate the number of luminaries needed to maintain an average illuminance of 500 lux on a working plane. Assume a maintenance factor MF of 0.85. (3marks)
   iv. Sketch the arrangement of luminaire determine in (iii) above. (1mark)
   v. Calculate the installed illuminance (achieved lux) after your design. (2marks)

b. In designing a power distribution in a commercial high rise complex, briefly explain the factors that you will consider to ensure safety, reliability and quality of power supply. (5marks)

c. In Kenya, a person shall not carry out electrical installation works without supervision unless you're licensed by EPRA as an electrician. Justify the importance of regulating the practice. State and briefly describe the different classes of licenses for electrical workers indicating the scope of work and requisite qualification. (5marks)

QUESTION FOUR (20 MARKS)

a. Consider the floor plan of residential apartment block shown in figure 4(a).
   i. As an aspiring graduate engineering technologist, sketch electrical installation design (lighting and standard power socket outlets including (U_s & DBs) for the floor plan using an appropriate symbol indicating a legend for the same. (5marks)
   ii. Prepare a bill of quantity for your design. (4marks)

b. Discuss the design guidelines for standard power socket outlets according to the IEE wiring regulations. (5marks)

c. With the aid of neatly drawn diagrams, briefly describe types of building and electrical installation lightning protection systems. (6marks)