INTERNATIONAL UNIVERSITY OF EAST AFRICA

'Learning to Succeed'

FACULTY OF ENGINEERING

END OF SEMESTER EXAMINATIONS - APRIL 2025

PROGRAMME: BACHELOR OF ELECTRICAL AND CONTROL ENGINEERING

YEAR/SEM: YEAR 4/SEMESTER 2

COURSE CODE: ELE4248

NAME: ILLUMINATION

DATE: 2025-04-16

TIME: 9:00AM-12:00PM

INSTRUCTIONS TO CANDIDATES:

1. Read the instructions very carefully
2. The time allowed for this examination is STRICTLY three hours
3. Read each question carefully before you attempt and allocate your time equally between all the Sections
4. Write clearly and legibly. Illegible handwriting cannot be marked
5. Number the questions you have attempted
6. Use of appropriate workplace examples to illustrate your answers will earn you bonus marks
7. Any examination malpractice detected will lead to automatic disqualification.

DO NOT WRITE ANYTHING ON THE QUESTION PAPER

Section A Answer any two questions

Question 1:

Question 6 [25 Marks]

(a) Assuming you have been appointed an engineer of Roofings limited, explain the properties of the filament material you would choose when buying Incandescent lamps (5 marks)

(b) Fluorescent lamps are affected by stroboscopic. Explain what it is and the two ways we can avoid it when wiring. (5 marks)

(c) Differentiate between an incandescent lamp and a fluorescent lamp when used in electric lighting systems (10marks)

Question 2:

Question 2 [25marks]

(a) Explain the two laws of Illumination. (6marks)

(b) Draw a graph showing the relationship between solid angle and plane angle. (4 marks)

(c) The front of a building 35 Ã? 18 m is illuminated by 15 lamps; the wattage of each lamp is 80 W. The lamps are arranged so that uniform illumination on the surface is obtained. Assuming a luminous efficiency of 20 lumens/W, the coefficient of utilization is 0.8, the waste light factor is 1.25, DF = 0.9. Determine the illumination on the surface. (8marks)

(d) A room with an area of 6 Ã? 9 m is illustrated by ten 80-W lamps. The luminous efficiency of the lamp is 80 lumens/W and the coefficient of utilization is 0.65. Find the average illumination. (7marks)

Question 3:

Question 4 [25 Marks]

(a) Explain the following terms in illumination engineering

(i) Reduction factor

(ii) Candle power

(iii) Utilization factor

(iv)Absorption factor

(v) Maintenancefactor (15marks)

(b) Describe the working principle of a simple photometer in measuring the candle power. Write the equations involved. (6marks)

(c) As an engineer, what requirements would consider in order to have a very good lighting system. (4marks)

Question 4:

Question 5 [25 Marks]

(a) Explain the three types of photometer heads that are commonly used in illumination. (12marks)

(b) Explain the three attributes (Hue, lightness, Chroma) of surface colours according to the Munsell system (6marks)

(c) Explain the term â??visual comfortâ?? and mention the two types of glare as applied in photometry (7marks)

Section B Answer any two questions

Question 1:

Question 9 [25 marks]

(a) Explain the three aspects of emergency escape lighting (6marks)

(b) A room 20 Ã? 10 m is illuminated by 60 W incandescent lamps of lumen output of 1,600 lumens. The average illumination required at the workplace is 300 lux. Calculate the number of lamps required to be fitted in the room. Assume utilization and depreciation factors as 0.5 and 1, respectively. (4marks)

(c) Mention three duties of a â??responsible personâ?? according to the British standard code of practice of emergency fire systems (6marks)

(d) What is emergency lighting and explain the two types of emergency lighting **(6marks)**

(e) Name three types of fire extinguishers used to put out a fire in industries **(3marks)**

Question 2:

QUESTION 10 [25marks]

(a) A 'secret key' switch is designed to allow testing of emergency lights while preventing non-authorized operation of the test switch.

Describe the three tests that are normally carried out using the secret key while maintaining emergency lights.

(6 marks)

(b) Government is currently offering a financial incentive to switch to low energy products and focus is now being put on using LED lights. Mention four advantages of using LED

lights in emergency lighting. (4 marks)

(c) The â??self-contained luminaireâ?? contains all the essential components for it to function as an independent emergency light. Give four advantages and disadvantages of using the self-contained luminaire. (8 marks)

(d) Distinguish between emergency escape lighting and standby lighting as applied to Illumination. (2 marks)

(e) Mention five standards of lighting used in Uganda (5marks)

Question 3:

Question 12 (25 marks)

(a) Define the following common terms in Electric lighting

(i) Lux

(ii) Watt

(iii) Lumen

(iv) Efficiency

(v) Efficacy

(vi) Colour rendering index

(vii) Incandescence **(21marks)**

(b) List any four types of lights commonly used in our day to day lives. (4marks)

Question 4:

Question 8 [25 Marks]

(a) Describe the following as applied to optics;

(i) Snellâ??s law

(ii) Total internal reflection

(iii) Critical angle

(iv) Lamberts law of absorption of Light.

(12marks)

(b) Distinguish between semidirect and indirect themes of lighting (6marks)

(c) Explain the two general principles usually employed in the designing of street lighting installations. (7marks)