

W1-2-60-1-6

JOMO KENYATTA UNIVERSITY OF AGRICULTURE AND TECHNOLOGY

**UNIVERSITY EXAMINATION 2017/2018**

**THIRD YEAR SECOND SEMESTER EXAMINATION FOR THE DEGREE OF BACHELOR OF ARACHITECTURAL STUDIES**

**ABA 2309: BUILDING ENVIRONMENTAL SCIENCE II LIGHTING**

**DATE: AUGUST 2018 TIME: 2 HOURS**

INSTRUCTIONS: ANSWER QUESTION ONE (COMPULSORY) AND ANY OTHER TWO QUESTIONS

**QUESTION ONE: 30 MARKS**

a. What is illumination. (2 marks)

b. If light is available as if it were “free of charge”, It should be utilized. Why is Artificial lighting necessary? (6 marks)

c. Define the following photometric terms:-

i. Illuminance. (2 marks)

ii. Steradian. (2 marks)

iii. Luminance. (2 marks)

iv. Lumen. (2 marks)

d. i. What does the Acronym “PSALI” stand for. (2 marks)

ii. Explain how you would determine the limiting depth and supplementary illuminance for all areas beyond the limiting depth. (6 marks)

iii. Outline the objectives of a PSALI Scheme. (4 marks)

e. What is VALUE as applied in the Munsell System of surface colour

classification. (2 marks)

**QUESTION TWO: 20 MARKS**

a. With the aid of a well illustrated diagram, describe four ways in which daylight may reach a point inside a building. (5 marks)

b. Distinguish between Uniform Overcast Skys and CIE standard Overcast Skys as used in natural lighting. (3 marks)

c. How would one establish the angle above the horizon at which the average brightness of a CIE Standard Overcast Sky occurs.

(6 marks)

d. Explain the advantages of basing Daylight design upon overcast sky. (6 marks)

**QUESTION THREE: 20 MARKS**

a. i. Describe two types of lamps that are commonly used in

electric lighting. (6 marks)

ii. What criteria would a designer use to specify either of the

two lamps? (4 marks)

b. State and explain two laws of illuminance. (10 marks)

**QUESTION FOUR: 20 MARKS**

a. State the principles of security lighting. (6 marks)

b. If you were commissioned to specify lighting for a NIGHT TIME GARDEN, what would you take into consideration when planning for maintenance. (8 marks)

c. List six effects of coloured light on the appearance and feeling of the night time Garden. (6 marks)

**QUESTION FIVE: 20 MARKS**

a. What is light output Ratio as applied to a luminaire? (3 marks)

b. i. State two key advantages of the Lumen method of lighting

design. (2 marks)

iii. Distinguish between utilization factor and maintenance factor as applied in the Lumen method of lighting design.

(6 marks)

c. A room measures 25m x 10m and the light fittings are mounted in the ceiling 2.5m above the working plane. The required illuminance is 330with a maintenance factor of 0.8

Calculate:-

i. The room index.

ii. The utilization factor.

iii. The number of light fittings.

iv. Whether the spacing/mounting height ratio is acceptable.

Data:

BZ 4 luminarie Max S/Hm=

Lighting Design Lumens of lamps = 6134 lumens – lamp Luminaire.

Lower Flux Utilance (LFU)=0.88.

Upper Flux Utilance (UFU)=0.42.

Downward Light Output Ratio (DLOR)=60%

Upward Light Output Ratio (ULOR)=20%

(9 marks)