TECHNICAL UNIVERISTY OF MOMBASA

Faculty of Engineering & Technology

DEPARTMENT OF ELECTRICAL & ELECTRONIC ENGINEERING

DIPLOMA IN ELECTRICAL POWER ENGINEERING (DEPE 6) (EVE/REG)

EEP 2305: ILLUMINATION ENGINEERING

END OF SEMESTER EXAMINATION
SERIES: DECEMBER 2014
TIME: 2 HOURS

Instructions to Candidates:
You should have the following for this examination

- *Answer Booklet*

This paper consists of **FIVE** questions. Answer any **THREE** questions
Maximum marks for each part of a question are as shown
This paper consists of **THREE** printed pages

Question One (Compulsory)

a) State the THREE laws of illumination. **(6 marks)**

b) Explain the following terms used in illumination:
- **(i)** Luminous flux
- **(ii)** Luminous intensity
- **(iii)** Luminance

c) For an extended source of light has a luminous intensity of load of angle of 60^{o} with a surface area of $100cm^{2}$. Calculate:
- (i) The brightness of the surface
- (ii) Total flux radiated by the light source
- (iii) The illumination on the surface given that the solid angle is 10^{o} **(8 marks)**

Question Two

a) State any FOUR factor considered when designing a lighting scheme. **(4 marks)**

b) Explain the effect of the following when designing a lighting scheme:
- **(i)** Reflection coefficient
- **(ii)** Maintenance factor
- **(iii)** Utilization factor **(6 marks)**

c) An examination room measured 30m by 10m requires 250lux to be provided by 300watts filament lamps which has a utilization coefficient of 0.4 and a depreciation factor of 0.9. If the luminous efficiency each lamp is 14 lumen/watt. Calculate the number of lamps required to illuminate the examination room. **(4 marks)**

d) Differentiate between the following lighting schemes:
- **(i)** Direct lighting schemes
- **(ii)** Semi-direct scheme
- **(iii)** General diffuse lighting schemes **(6 marks)**

Question Three

a) (i) With the aid of a diagram, explain the operation of an integrating sphere in measurement of light.
(ii) For the integrating sphere, show that:

$$E = \frac{J\phi_r}{S}\left[1 + {}^{2} + {}^{3} + ... {}^{n-1}\right]$$

(14 marks)

b) With the aid of a diagram explain the measurement of light using polar curves. **(6 marks)**

Question Four

a) State any FOUR the properties of tungsten as a material used in a incandescent lamps. **(4 marks)**

b) With the aid of a well labeled diagram explain the operation of filament incandescent ramp. **(8 marks)**

c) A filament lamp has 32cd candle power with a filament of 1m long and a diameter of 0.00025 metres. Calculate the length and diameter of a second filament of the same material which will give 16 and 200volts. **(8 marks)**

Question Five

a) With the aid of a diagram explain the operation of a sodium vapour discharge lamp. **(8 marks)**

b) (i) Explain "stroboscopic effect" in fluorescent lamps. **(2 marks)**

(ii) State any FOUR effects of stroboscopic effect on the working surface (illuminated surface) **(4 marks)**

c) With the aid of a well labeled diagram explain the operation of a low pressure mercury vapour ramp. **(6 marks)**