Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS/B. OPTM/SEM-3/BO-302/2009-10

2009
LIGHTING & THE EYE

Time Allotted : 3 Hours Full Marks : 70

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

GROUP – A
(Multiple Choice Type Questions)

1. Choose the correct alternatives of the following : 10 × 1 = 10

   i) At room temperature a blackbody appears as

      a) red b) blue

      c) black d) yellowish-white.

   ii) 'Nits' is the unit of

      a) Luminous flux

      b) Luminous intensity

      c) Luminance

      d) Illumination.

iii) To describe the colour of daylight

a) CT is used

b) CCT is used

c) CRI is used

d) daylight factors is used.

iv) Flicker photometer can work when two sources are

a) monochromatic

b) emitting the same wavelength

c) emitting different wavelength

d) both (a) & (b).

v) Photopic vision is

a) dim light vision

b) bright light vision

c) both of these

d) none of these.

vi) The harmful effect of glare can be reduced in practice by

a) placing opaque shield in front of the source

b) using diffusing enclosure

c) increasing the background illumination level

d) all of these.

vii) Stroboscopic effect of light is present in

a) discharge lamp

b) incandescent lamp

c) halogen lamp

d) none of these.

viii) The photometer based on visual photometry is

a) photovolatic cell

b) photoconductor cell

c) guild flicker photometer

d) junction photodiode.

ix) To which wavelength our eye is most sensitive ?

a) 380 nm b) 550 nm

c) 632 nm d) 1064 nm.

x) For a perfect diffuser

a) luminous flux

b) luminous intensity

c) illumination

d) luminance.

GROUP – B

(Short Answer Type Questions)

Answer any *three* of the following. $3 \times 5 = 15$

2. a) What is CIE ?

   b) What do you mean by CIE standard observer ?

   c) Draw the $V_\lambda - \lambda$ curve of a standard observer. 1 + 2 + 2

3. Draw and explain the polar diagram of an incandescent lamp. 5

4. a) Define luminous intensity and its unit candela.

   b) What source is currently being used as a standard source ? 4 + 1

5. a) How can you define standard of a lamp ?

   b) Define luminous efficacy of a lamp.

   c) What is the maximum efficacy that can be achieved in a General Service Lamp (GSL) ? 2 + 2 + 1

6. a) Draw spectral luminous efficiency curve of human eye.

   b) Explain the basic principle of a photodiode. 2 + 3

7. Distinguish between the following : $2 \times 2\frac{1}{2}$

   a) Photopic and Scotopic vision

   b) Visual and physical photometry.

GROUP – C

(Long Answer Type Questions)

Answer any *three* of the following. 3 × 15 = 45

8. a) Briefly discuss the construction and working principle of the LB-photometer.

   b) Write down the conditions to be maintained to operate a flicker photometer correctly.

   c) Two sources are situated at 60 cm and 40 cm distances from a Bunsen grease photometer when the illumination due to two lamps over the grease spot appears same. Then the intense source is covered and intensity reduced to 80% of the initial intensity. At what distance should the intense bulb be placed to get back the initial condition again. 6 + 4 + 5

9. a) Prove that for a perfect Lamertian surface $\phi = \pi L$, where the symbols have their own significance.

   b) What do you mean by colour correction and cosine correction of a photocell ?

c) The illumination required inside a room 20 m × 18 m is 100 lux. Find out the no. of co-efficient of utilization = 0·75.

maintenance factor = 0·75

lamp efficacy = 10 lm/watt

power of each lamp = 200 watt. 5 + (3 + 3) + 4

10. a) Briefly discuss the four lighting schemes for interior lighting.

b) A lighting scheme is required for small 8 × 8 library room. The height of the ceiling and the working plane are respectively 3 m and 0·8 m. The surface reflectance of the ceiling, the wall, and the floor are 0·7, 0·3, 0·2 respectively. Luminaire to be used has quoted a maximum S/h_m ratio of 1·95. Suggest a general lighting scheme for the room considering the maintenance factor 0·68. 8 + 7

11. a) Distinguish between incandescent lamp and discharge lamp.

b) Write down the construction of sodium vapour lamp.

c) State different light loss factors.

d) Define ULOR and DLOR. 3 + 4 + 4 + 4

12. a) Discuss on LUX meter sensor. Why is colour correction and cosine correction necessary for a LUX meter sensor ? 7

b) A certain 100 watt light bulb emits a total luminous flux of 1200 lumen, distributed uniformly over a hemisphere. Calculate the luminance and the luminous intensity at a distance of 1 m and at 5 m. 5

c) Write down the mathematical relation between lumen and watt for photopic vision. 3

13. Write short notes on any *three* of the following : 3 × 5

a) Photomultiplier

b) Colourimetry

c) Isolux diagram

d) VDU design of work station

e) Eye protectors.