Total No. of printed pages = 3

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Roll No. of candidate | | | | | | | | | | |

2023

B.Tech. 8th Semester End-Term Examination

ILLUMINATION ENGINEERING

New Regulation (w.e.f. 2017-18) & New Syllabus (w.e.f. 2018-19)

Full Marks – 70 Time – Three hours

The figures in the margin indicate full marks for the questions.

PART A — (10 × 1 = 10 marks)

Answer all the questions for this part

1. Multiple choice questions

(i) Luminous flux is

(a) The rate of energy radiation in the form of light waves

(b) The part of light energy radiated by sun that is received on earth

(c) Measured in lux

(d) All of the above

(ii) The illumination is directly proportional to the cosine of the angle made by the normal to the illuminated surface with the direction of the incident flux. Above statement is associated with

(a) Planck's law (b) Macbeth's law of illumination

(c) Bunsen's law of illumination (d) Lambert's cosine law

(iii) Which of the following will need the highest level of illumination?

(a) Proofreading (b) Bed Room

(c) Hospital wards (d) Railway platforms

(iv) The unit of solid angle is

(a) Solid Angle (b) Radian

(c) Steradian (d) Candela

(v) The illumination at the various points on a horitozontal surface illuminated by the same source varies as

(a) $Cos\theta$ (b) $Cos^2\theta$

(c) $Cos^3\theta$ (d) $1/\cos\theta$

[Turn over

(vi) Light is produced in electric discharge lamps by

(a) Heating effect of current (b) Magnetic effect of current

(c) Ionization in a gas or vapour (d) Carbon electrodes

(vii) The S.I unit of Luminance is

(a) Candela (b) Lux

(c) Candela/m^2 (d) m^2/candela

(viii) Determine the power factor of 220V, 0.4A, 20W fluorescent lamp

(a) 0.228 (b) 0.438

(c) 0.843 (d) 0.4038

(ix) In a fluorescent tube circuit, choke acts as

(a) Starter (b) The power factor improving device

(c) Source of heat (d) Current limiting device

(x) For operation of fluorescent tube on DC supply the additional device incorporated in the Tube circuit is a

(a) Transformer (b) Resistor

(c) Inductor (d) All of the above

PART B – (4 × 15 = 60 marks)

Answer any *four* question for this part

2. (a) State and proof Lambert's Cosine law (5)

(b) Define the following term: (5 × 2 = 10)

(i) Black body

(ii) Candle foot

(iii) Reduction factor

(iv) Glare

(v) MSCP

3. (a) Give the comparison between incandescent lamp and fluorescent lamp. (5)

(b) Derive the relationship to find the illumination at any point on the surface due to light source suspended at a height of h from the surface. (5)

(c) Explain glow type starter. (5)

4. (a) What are the ageing effects on incandescent lamp? (5)

(b) A lamp of 500W having a MSCP of 1250 is suspended 12.7 meters above the working plane. (5)

(i) Calculate illumination directly below lamp at the working plane

(ii) Lamp efficiency

(iii) Illumination at a point 3m away on the horizontal plane from vertically below the lamp

(c) How to draw a vertical polar curve using Rousean's construction? (5)

5. (a) Explain the working of a high pressure mercury vapour lamp with diagram. (5)

(b) Explain the working of a Bunsen Grease type spot photometer. (5)

(c) Why does a black body appear black in room temperature? (5)

6. (a) Explain the working of fluorescent lamps for D.C. supply. (5)

(b) It is desired to illuminate a drawing hall with an average illumination of about 250 lux. The area of the hall is $(25 \times 30)m^2$. The lamps are to be fitted at 5m height. Find out the number and size of incandescent lamps required for an efficiency of 12 lumens/watt. UF =0.4, MF = 0.85. (5)

(c) A 280V lamp has total flux of 1500 lumens and takes a current of 0.4A. Calculate lumen per watt and MSCP per watt of the lamp. (5)

7. (a) Describe the different types of lighting scheme. (10)

(b) State the guidelines adapted for industrial lighting. (5)