

**ILLUMINATION ENGINEERING
(ELEC 3132)**

Time Allotted : 3 hrs

Full Marks : 70

Figures out of the right margin indicate full marks.

*Candidates are required to answer Group A and
any 5 (five) from Group B to E, taking at least one from each group.*

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

**Group – A
(Multiple Choice Type Questions)**

1. Choose the correct alternative for the following: **10 × 1 = 10**
- (i) Auto transformer used with sodium vapour lamp should have
 - (a) high efficiency
 - (b) high step- up ratio
 - (c) high step- down ratio
 - (d) high leakage reactance
 - (ii) Candela is the unit of
 - (a) Luminance
 - (b) Luminous flux
 - (c) Luminous intensity
 - (d) Wavelength
 - (iii) Luminous efficacy of a fluorescent lamp is
 - (a) 5- 10 lumens/watt
 - (b) 15-20 lumens/watt
 - (c) 30-40 lumens/watt
 - (d) 60-65 lumens/watt
 - (iv) Power factor is highest in case of
 - (a) Mercury arc lamp
 - (b) Sodium vapor lamps
 - (c) Fluorescent lamp
 - (d) GLS lamps.
 - (v) Which of the following lamp gives nearly monochromatic light?
 - (a) Sodium vapor lamp
 - (b) GLS lamp
 - (c) Fluorescent lamp
 - (d) Mercury vapor lamp.
 - (vi) A lamp has a total luminous flux of 1570 lumens. Its mscp is
 - (a) 125
 - (b) 250
 - (c) 200
 - (d) 500
 - (vii) Which photometer is used for comparing the lights of different colours?
 - (a) Bunsen photometer
 - (b) Grease spot photometer
 - (c) Lummer Brodhun photometer
 - (d) Flicker Photometer

B.TECH/EE/5TH SEM/ELEC 3132 (BACKLOG)/2020

- (viii) Melting point of tungsten is
 (a) 2000°C (b) 2500°C
 (c) 2655°C (d) 3400°C
- (ix) The colour having longest wavelength is
 (a) Red (b) Blue
 (c) Violet (d) Green
- (x) Fluorescent lamp operating on dc supply needs which element in addition to a starter and a choke.
 (a) resistor (b) capacitor
 (c) inductor (d) both inductor and capacitor

Group – B

2. (a) Differentiate between photopic vision and scotopic vision.
- (b) Two lamp posts are 10m apart and are fitted with 100CP lamp each at a height of 6m above the ground. Calculate the illumination on the ground
 (i) under each lamp.
 (ii) midway between the lamps.
- (c) Show that the illuminance received at any position on the surface of the integrating sphere from any point lying on the surface is independent of the position on the inner surface.

4 + 4 + 4 = 12

3. (a) Distinguish between illuminance and exitance.
- (b) Determine the mid zonal intensity, zonal constant and zonal lumen of the luminaire whose intensity distribution is as follows:

Gamma	C 0°	C 45°	C 90°
5°	60	60	60
15°	58	56	54
25°	56	50	46
35°	52	48	40
45°	48	42	32
55°	42	34	22
65°	36	26	12
75°	28	16	2
85°	20	6	0

2 + 10 = 12**Group – C**

4. (a) Briefly explain the principle of operation of electronic ballast with the help of a neat circuit diagram.

B.TECH/EE/5TH SEM/ELEC 3132 (BACKLOG)/2020

- (b) What do you mean by regenerative cycle in halogen lamps? **9 + 3 = 12**
5. (a) Briefly discuss the construction and principle of operation of low pressure sodium vapour lamp with the help of a neat diagram.
- (b) What do you mean by stroboscopic effect? How is it eliminated? **7 + 5 = 12**

Group – D

6. An illumination of 75 lux is required on the working plane in a factory shed area 72m X 15 m in size. The lamps are required to be hung 4m above the working plane.
- (i) Which type of lamp is used for the design and why?
- (ii) What is the efficacy of the lamp?
- (iii) Assuming utilisation factor of 0.5, candle power depreciation of 20%, estimate number and rating of the lamps.
- (iv) Draw the disposition of the lamps.
- (v) Determine space-height ratio of your design. **(2 + 1 + 2 + 5 + 2) = 12**

7. (a) Distinguish between disability glare and discomfort glare.
- (b) Show that the effective ceiling cavity reflectance ρ_{cc} for a hemispherical dome is given by

$$\rho_{cc} = \frac{\rho_s}{2 - \rho_s}$$

where ρ_s is the reflectance of the ceiling surface.

- (c) Explain "Watts per square metre" method of indoor lighting design.
- (d) As per IS3646 the recommended range of service illuminance for relay and telecommunication rooms in an electricity distribution plant is 200-300-500 lux. From this range how do we determine the value for which we will do the design?

2 + 3 + 3 + 4 = 12

Group – E

8. (a) The front of a building measuring 60m X 15m is to be floodlighted by means of projectors placed at a distance of 15m from the wall. The average illumination required is 50lux.
- (i) Which lamp is used for the design and why?
- (ii) Assuming waste light factor of 1.2, maintenance factor of 0.6 and coefficient of utilisation of 0.5, determine the number of projectors used.
- (iii) Determine the beam angle of the projector.
- (b) If a floodlighting luminaire is designated "NEMA 6X5", what does it imply?

B.TECH/EE/5TH SEM/ELEC 3132 (BACKLOG)/2020

(c) What is high mast lighting?

(2 + 2 + 2) + 3 + 3 = 12

9. (a) Distinguish between transverse, longitudinal and overall uniformity.

(b) What are isofootcandle diagrams? How are they used in road lighting calculations?

(c) What are the different types of arrangement of road lighting luminaires according to the width of the road and mounting height of the luminaires?

3 + 5 + 4 = 12

Department & Section	Submission Link
EE	https://classroom.google.com/c/MjQ4OTQ5OTkyNjcz/a/MjcxNjQ3NDAwMjM0/details