**B.E. INSTRUMENTATION AND ELECTRONICS ENGINEERING**

**FOURTH YEAR, SECOND SEMESTER EXAMINATION 2023**

# LIGHTING AND HUMAN FACTORS

Time : Three hours Full Marks : 100

**( 50 Marks for each Part ) Use separate answer script for each Part**

PART I (50 Marks)

**Answer any two questions**

1. a) What is the significance of the term Human Centric Lighting? 10

b) Discussed about the different studies on impact of lighting conditions on work performance from the face validity and generality point of view. 15

2. a) Discuss about the three routes whereby lighting conditions can influence human performance with the help of a schematic conceptual framework diagram. 13

b) What is the basic difference between visual performance and task performance and human performance? 12

3. a) Write a note on Relative Visual Performance Model (RVP) 6

b) What do you mean by 'non-visual / non-image forming effect' of light? 8

c) Explain Weston's Landolt's ring chart based experiment for analytical study to identify the effect of illuminance on mean performance of the human subjects. 5

d) What are fundamental steps you have to follow, if you want to propose a human centric lighting design solution for your classroom? 6

*Ref. No.* Ex/FET/OE/ELE/T/205/2023

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**(50 marks for each part)**

**Use separate Answer-Script for each part**

| No. of question | **Part II**<br>**Answer any three questions.**<br>**Two marks reserved for neatness and well organized answer.** | Marks |
|---|---|---|
| 1.a) | What do you understand by photopic, scotopic and mesopic vision? Explain with their corresponding visual response curve. | 8 |
| b) | 'Photometry is a part of Radiometry but vice versa is not always true' — Justify. | 4 |
| c) | What do you mean by 'visual photometry'? Mention its differences from 'detector-based photometry'. | 4 |
| 2.a) | Derive the expression for Inverse square Cosine law of horizontal illuminance with proper diagram. | 6 |
| b) | Briefly discuss about effects of optical radiation on human skin. | 4 |
| c) | Write down the effect of UV and IR radiation on human skin. | 6 |
| 3.a) | Briefly discuss on lamp selection parameters with examples. | 4 |
| b) | Justify the application of following lamps -<br>(i) High Pressure Sodium Vapour lamp in Roadlighting (ii) WLED lamp in sports lighting (iii) CFL in office lighting iv) LED as Energy Saver. | 8 |
| c) | Briefly discuss about the basic features of a luxmeter sensor. | 4 |
| 4.a) | Discuss the starting operation of a pre-heat fluorescent lamp with magnetic ballast with necessary circuit diagram. Mention the functions of starter and ballast. | 8 |
| b) | Discuss about different types of luminaires with different lighting schemes. Define light output ratio (LOR) of a luminaire. | 8 |
| 5.a) | Write short notes on:<br>i) Spectral Power Distribution of Lamps<br>ii) Laws of Thermal Radiator. | <br>8<br>8 |