EX/EE/ PE/B/T /421F/ /2023

B.E Electrical ENGG.4th Year 2nd Sem. EXAMINATION, 2023

ADVANCED LIGHTING CALCULATION AND DESIGN

Time : Three hours **Full Marks : 100**

(50 marks for each part)

Use separate Answer-script for each part

PART – I

Q 1 is COMPULSORY

1. A square area of 56m side is illuminated by placing two poles at only one of the sides of the area, the pacing between the two poles being 20m. The poles are of 16 m height and each of them carries 6x400W SON loodlights. Each pole is located 2.25 m outside the boundary line of the area. Using the given diagram , and howing each step clearly, find out the followings :

i) the Utilization Factor

ii) the average horizontal illuminance on the area

iii) the illuminances obtained when 25%, 50% and 75% of the lamps are made OFF

iv) the points where minimum illuminance will be obtained.

[Given: the total initial lamp lumen = 48.5 Klm, the depreciation factor = 0.8, the maintenance factor = 0.7, he atmospheric loss factor = 0.9]

Photocopy of Fig.1 is attached, submit the diagram if used. 20

Answer Any TWO from rest of the Questions.

2. (a) Explain the method of Illuminance calculation from a circular shaped diffused source of 3 ft diameter at a point vertically 8ft.below.If the source diameter is made doubled, four times, what will be the illuminance values at that point?

Drawing a graph, show the variations. 5

(b)Write short notes on : 6

(i) Floating and Maintained type Emergency Lighting system.

(ii) Classification of Flood-Lights as per Indian Standard [IS13383 (Part3):1992].

(c) Write down any of the four guidelines for the selection of Flood Lighting Equipment. 4

3. (a) Describe : 6

(i) Two types of Motor –Generator Set driven Emergency Lighting system.

(ii) American Standard [NEMA] classification system with necessary diagrams..

(b) Show a proposed schematic Block Diagram of a solar powered non-maintained emergency Lighting system connected to any ten places of your Department , where emergency lamps are required. 6

(c) Merits & Demerits of using High Frequency Inverters in Emergency Lighting system. 3

4. (a) Explain the method of illuminance calculation at a point from a Triangular diffused source . 8

(b) Explain how would you find out the illuminance at a point from a diffused rectangular ceiling surface area and a rectangular wall surface area.
7

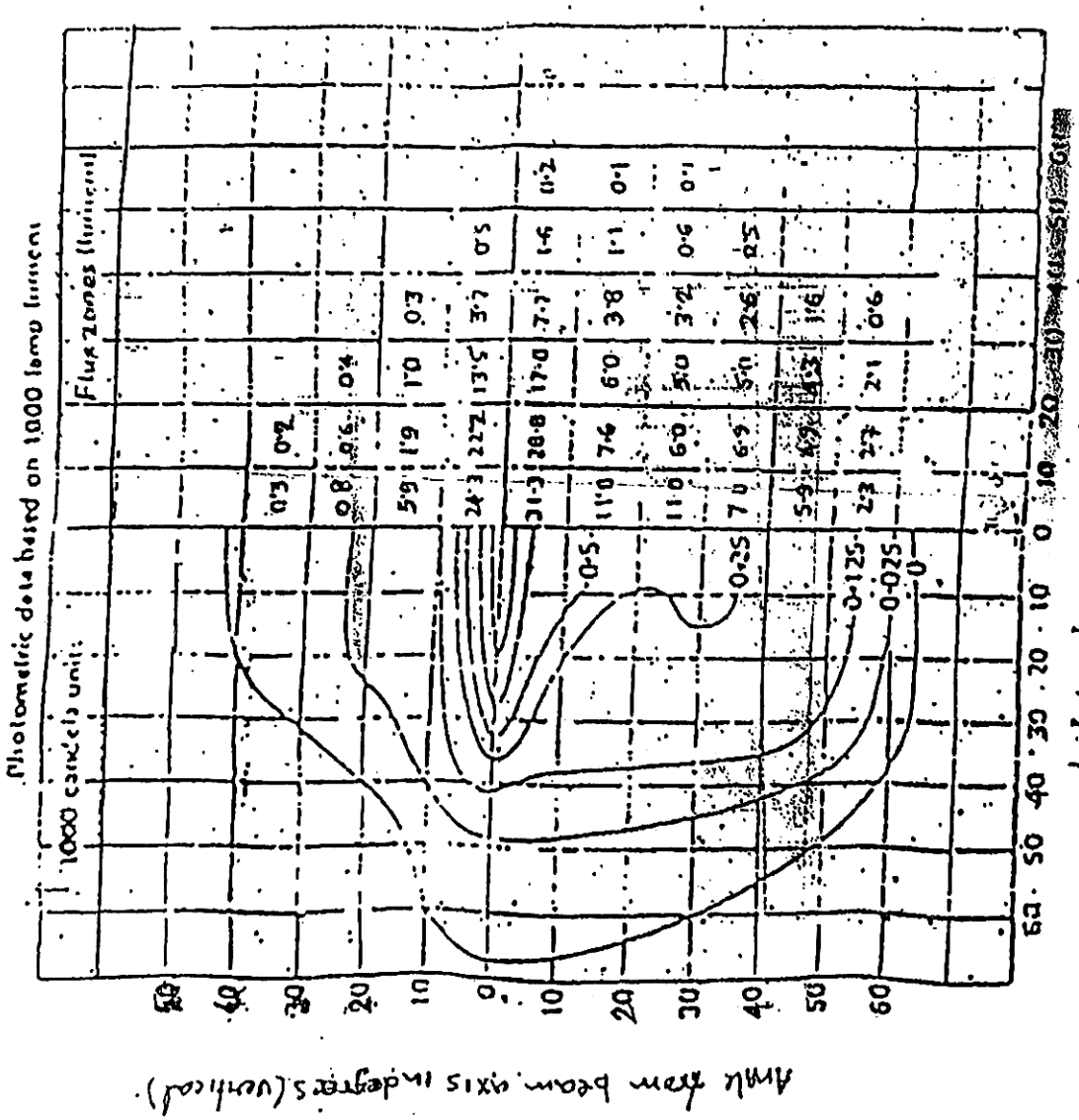

Fig. 1. Zonal flux and isocandela diagrams for floodlighting

Ref.No. Ex/EE/PE/B/T/421F/2023

B.E.Electrical Engg. Examination 2023

[4th Year; 2nd Semester]

Subject: Advanced Lighting Calculation and Design

Part-II

Time: 3 hours | Use Separate Answer script for each part | Full Marks:100 (50 marks for each Part)

[Answer ALL Questions]

Q.1.	Explain and justify the following statements with suitable example- i) The quantity and quality of available daylight at any location are time-varying parameters. OR i) Daylighting system is always to be supplemented by sensor-based automated artificial lighting system. ii) Daylight coefficient (DC) method is applicable as daylight prediction tool for all types of sky condition; whereas Daylight Factor (DF) is applicable only for overcast sky condition. OR ii) Daylighting design approach is based on available diffuse daylight not on available direct daylight. iii) Glare evaluation of roadlighting installation is not possible in case of illuminance based design approach. OR iii) Nine-point method is applicable for on-site evaluation of roadlighting installation, not during roadlighting design iv) Longitudinal uniformity is an essential design parameter in case of roadlighting design. OR iv) Lateral uniformity can be improved by adjusting luminaire tilt.	10 [CO1]
Q.2.	Describe the luminance based design parameters for roadlighting installation. OR Describe the procedure to compute point-specific horizontal illuminance due to single-sided roadlight installation.	10 [CO2]
Q.3	Derive the mathematical expression of point-specific horizontal illuminance due to an unobstructed sky patch limited by altitude angles [γ_1, γ_2] and azimuth angles [α_1, α_2]. OR Derive the mathematical expression of 'daylight coefficient' for computation of point-specific horizontal illuminance.	10 [CO3]
Q.4.	What are the cost components of a lighting installation? How the concept of payback period method is applied to compare cost-benefit analysis of any lighting design scheme? OR How the concept substitution method is applied in 2π-photometry and 4π-photometry luminous flux measurement using sensor-based integrating sphere?	10 [CO4]
Q.5.	Analyze the special design consideration of daylight integrated artificial lighting system with suitable examples. OR Compare between top-lighting and side-lighting daylighting schemes with suitable examples and analyze their relative performance.	10 [CO5]