MASTER IN ILLUMINATION ENGG. FIRST YEAR 2ND SEMESTER EXAMINATION, 2018

COMPUTER AIDED LIGHTING SYSTEM DESIGN

Time : Three hours   Full Marks : 100

Use separate Answer-script for each part
PART – I   (60 Marks)

Answer any three questions.

1.(a) Show a flow chart, describing the function of zonal flux and iso-candela diagram in Flood-lighting calculation.   8

(b) An equilateral triangular park of 40m side is illuminated by placing six 400W son floodlights on a 12m pole at one of the vertices. Using the given zonal flux diagram of Fig. 1, and showing each step clearly, find out the followings:
   i)   The Utilization Factor
   ii)   The average horizontal illuminance on the area
   iii)   If 50% of the lamps are made off, what will happen?

   Given: the total initial lamp lumen = 48 Klm, the depreciation factor = 0.85, the maintenance factor = 0.75, the atmospheric loss factor = 0.9.
   Photocopy of Fig.1 attached.   12

2. (a) Describe the method of Illuminance calculation at a point on the floor from large   right-angled triangular shaped ceiling, rectangular shaped ceiling and wall.   6+4+4=14

   (b) Write down the Algorithm to find out CSP index & explain its necessity.   6

3. (a) Explain with necessary diagrams any two of the following illuminance calculation methods.
      i) Conical
      ii) Hemi-Spherical   5+5=10
      iii) Semi -Cylindrical

   (b) Write down the Flow Chart for the selection of High-mast pole heights to illuminate a large area. Design the lighting scheme & sketch the layout of a storage area of 200 ft x1000ft dimension with 100 lux Illumination. Use the Quick selector method and consider the graphs of Fig. 2.   10

4. (a) Show the flow chart to find out indirect component of mean room surface illuminance by Cuttle's method. 4

(b) Explain the term ESI. How would you determine the place where ESI would be high? 4

(c) Write down the Algorithm to find out CSP index & explain its necessity. 6

(d) Compare the differences between the Indian Standard based Floodlight Classification system and NEMA based classification system. 6

5. (a) Mention the places of maintained type good Emergency Lighting system, which should be installed in any house. What are the differences between Battery-Inverter based and Motor Generator based Emergency Lighting system, draw the necessary diagrams. 8

(b) Using Vector method , find the direct component of Cubic illuminance at point 'a' as shown in Fig. 3, having four Wing-C type luminaires (each having 2XPL-L 36W, 865,2900lm) fitted in the false ceiling of the room.. Assume $p_f = 0.2$, $p_c = 0.7$, $p_w = 0.5$, $mf = 0.65$, $DF(F) = 0.3$, $DF(W) = 0.2$.
Use the Intensity Table given below: 12

Angle in deg	0.0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90
I in cd/1000lm	227	222	215	210	204	185	170	150	138	109	80	65	45	33	24	16	11	5	0

Photometric data based on 1000 lamp lumens

1000 candela units | Flux zones (lumens)

0.3	0.2						0.5
0.6	0.6	0.4					1.6
5.9	1.9	1.0	0.3				9.1
24.3	22.7	13.5	3.2	0.5			64.2
31.3	28.8	17.8	7.7	1.6	0.2		87.4
11.8	7.6	6.0	3.0	1.1	0.1		30.4
11.8	6.0	5.0	3.2	0.6	0.1		27.6
7.8	6.0	5.0	2.6	0.5			22.8
5.9	4.9	4.3	1.6				16.7
2.3	2.3	2.1	0.6				7.3
Vertical totals							
102.0	82.8	55.1	23.0	4.3	0.4		267.6

Angle from beam axis in degrees (vertical)

Horizontal totals

Isocandela contours: 0.5, 0.25, 0.125, 0.025, 0

60 50 40 30 20 10 0 10 20 30 40 50 60

Angle from beam axis in degrees (horizontal)

Fig. 1 Zonal flux and isocandela diagrams for floodlighting.

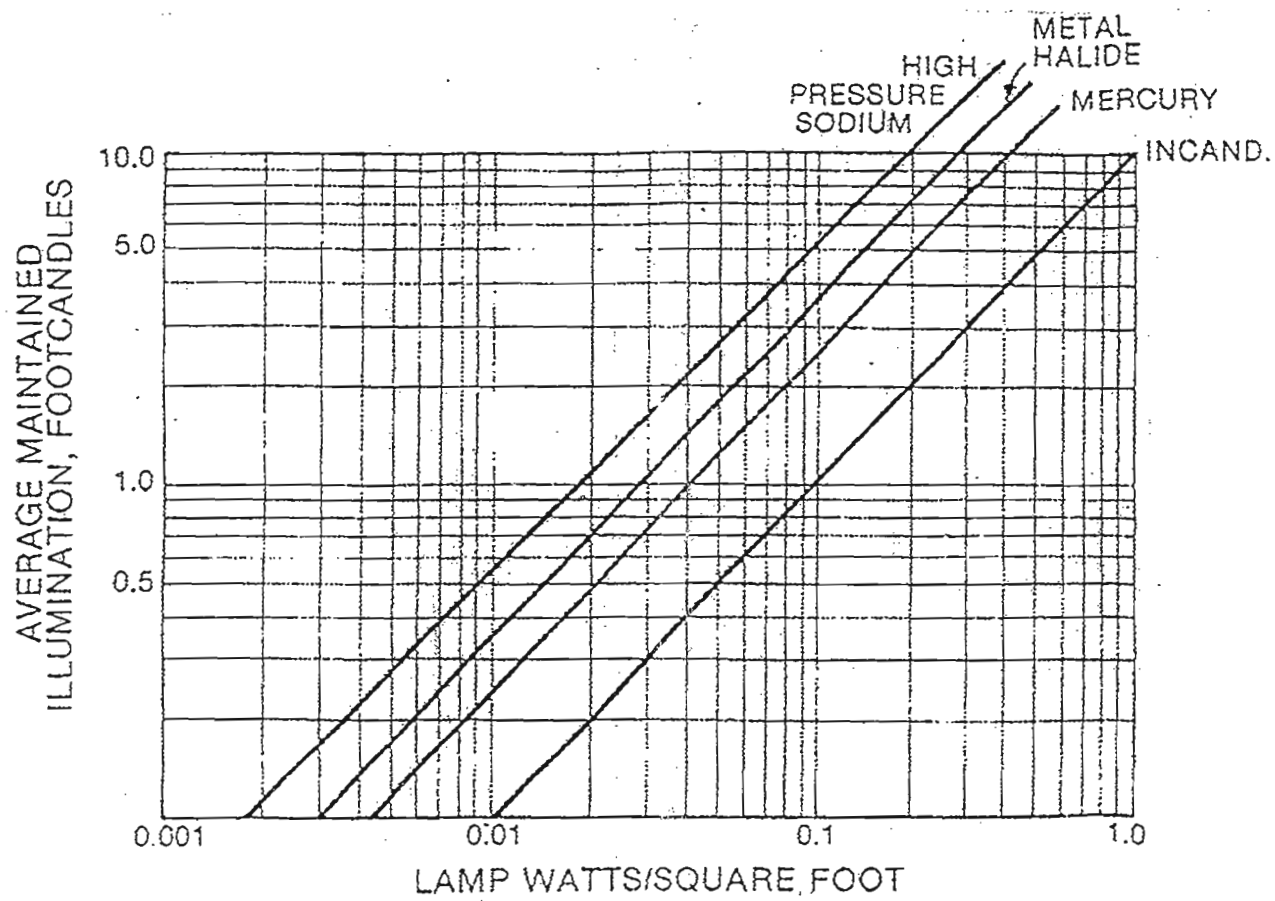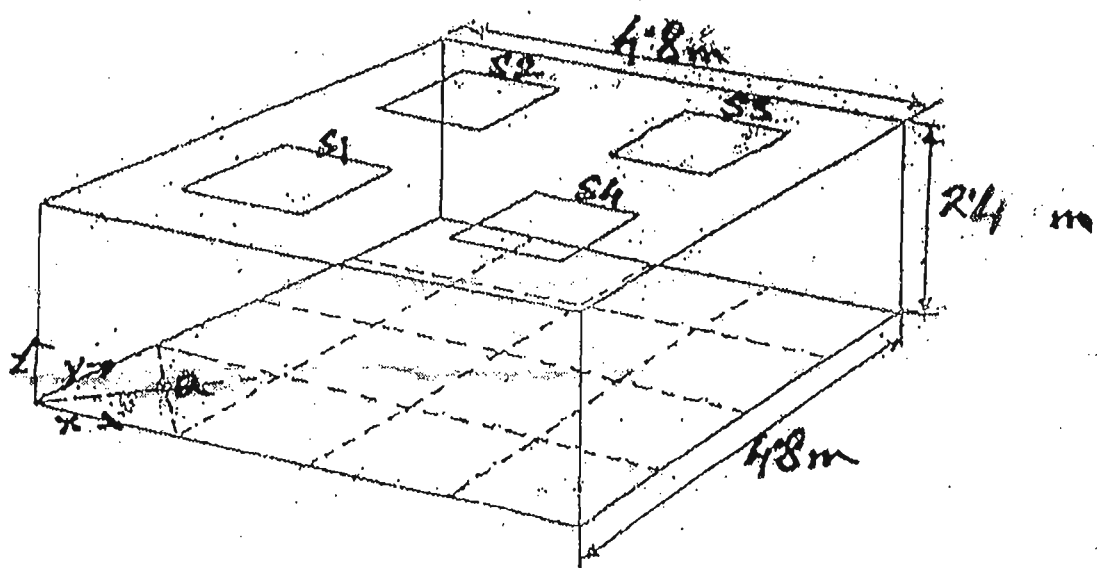Fig. 2

S1, S2, S3, S4   luminaires

Fig. 3

M.E. Illumination Engineering 1st Year 2nd Semester 2018
Time: 3 Hours   Full marks 100
Subject: Computer Aided Lighting System Design

<u>Use separate Answer script for each Part</u>

<u>Part-II (40 Marks)</u>
<u>Answer any Two questions</u>

Q.1. A) Briefly discuss the roadlighting design parameters as per CIE115:2010.
B) Write down the steps of point-specific illuminance computation on a road surface for a staggered pole installation. How E_{avg}, U_o, U_L are computed? [Symbols have their usual meaning]

20

Q.2. A) What do you understand by M- lighting class, C- lighting class and P-lighting class?
B) Discuss the procedure of determination of M-lighting class.

$12+8=20$

Q.3.A) What are special lighting design parameters applicable for sportslighting? Discuss how the recommended values of these parameters differ depending on types of sports.
B) How Glare Rating is calculated in case of sportslighting?

$10+10=20$

Q.4. A) How the reflection characteristics of dry road surface is specified? Briefly discuss the parameters.
B) Write down the mathematical expression of UGR and explain each term. Discuss the applicability and limitations of the UGR model.

$10+10=20$

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