Reference No. Ex/PG/IlluE/T/111A/2024

M.E. ILLUMINATION ENGINEERING 1st YEAR 1st SEMESTER EXAMINATION 2024

TIME: 3 HOUR FULL MARKS: 100

SUBJECT: ADVANCED PHOTOMETRY

(Answer each Part in a separate Answer script)

PART-I (34 Marks)

ANSWER Q.No.1 AND ANY TWO QUESTIONS

Q.1. Answer **any five** from the followings-

A) CIE standard illuminant, either 'A' or 'D65', is required to compute color rendering index of a test lamp - explain.

B) In case of LEDs of any saturated color, the concept of correlated colour temperature is not applicable - explain.

C) Source color theory is known as Additive color theory; whereas Object color theory is known as Subtractive color theory - explain

D) Physical significance of the step size of MacAdam's ellipse with suitable example – explain.

E) Draw and briefly describe the structure of the color vision model of human visual system.

F) Draw and briefly describe the structure of the (L a^* b^*) model.

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Q.2. A) What are application of the CIE Standard Illuminant?

B) Briefly describe how dominant wavelength and purity are determined from a given chromaticity of light source of saturated color.

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Q.3. Briefly discuss the procedure to apply McCamy formula for the computation of CCT of a test lamp from its chromaticity coordinate.

7

Q.4. Briefly describe the CIE 1931 XYZ chromaticity system with suitable diagram and discuss how source chromaticity is determined from lamp's SPD data.

7

Q.5. Compute the chromaticity of the resultant radiation when radiations from the following lamps are mixed uniformly –

Parameters	Lamp A	Lamp B	Lamp C
x	0.6	0.5	0.2
y	0.3	0.4	0.3
Wattage (W)	36	18	54
Luminous Efficacy (lm/W)	10	20	30
Quantity	3	2	5

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Ref. No Ex/PG/IlluE/T/111A/2024

MASTER IN ILLUMINATION ENGG FIRST YEAR FIRST SEMESTER EXAMINATION, 2024

(1st/2nd ~~Semester/Repeat/Supplementary/Annual/Bi-Annual~~)

SUBJECT Advanced Photometry
(Name in full)

PAPER.....

Time : ~~Two hours~~/Three hours/~~Four hours/Six hours~~

Full Marks 100
(33 marks for this part)

Use a separate Answer-Script for each part

No. of questions	Part II Total marks 33	Marks
1.	**Question No.1 is compulsory and Answer any 2 from the rest** **Answer any 3 (3 X 3=9) of Question No.1** **Justify the following, do necessary corrections, if required**	
i)	Five plane photometry is adequate for LED based lighting system.	
ii)	Baffle is used in integrating sphere based lumen measurement for taking care of spectral mismatch correction.	
iii)	Sensor, detector and meter are same for a photometric instrument.	
iv)	No sensor type detectors are the most accurate detectors for photometric measurements.	
v)	Photopic lumen of a light source is always less than the scotopic lumen of the same source.	
vi)	LED package, LED array, LED module, LED lamp non-integrated, LED lamp integrated and LED luminaire as defined by ANSI/IESNA RP-16-05 are same.	
	Answer any 2 (2 X 12 =24)	
2.(a)	What is NIST absolute integrating sphere method used for realization of luminous flux as designed by Yoshi Ohno?	6
(b)	Why this method is preferred over gonio-photometric for realization of luminous flux standrd?	3
(c)	What is the significance of the term '**transfer**' for luminous flux standard lamps?	3
3. a)	What do you mean by S/P ratio of a light source.	3
b)	Discuss the basis of development of mesopic vision?	3
c)	Discuss effectiveness of a white light source from modified CIE mesopic table with a suitable example as cited by MB Kostic and LS Djokic	6
4.a)	What are the different International standards available for Solid-state Lighting (SSL) ?	4
b)	What are the different parameters to be included in any LED test report according to the IES-LM-79-08 standard?	5
c)	What do you mean by reference plane for a detector? How the reference plane of a detector can be detected?	3

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M.E. IN ILLUMINATION ENGINEERING FIRST YEAR FIRST SEMESTER EXAMINATION, 2024

SUBJECT: ADVANCED PHOTOMETRY

Time :Three hours **Full Marks: 100**
(33 marks for this part)

Use separate answer script for each part

No. of question	**Part-III (33 Marks)** **Answer any three questions(3X11=33)**	Marks
1.a)	Briefly discuss about the components of a spectroradiometer.	8
b)	Write down the advantages of using a double monochromator in spectroradiometer.	3
2.a)	"Accurate lamp lumen & constant calibration of photometric range is not required in relative photometry"---Correct and/or justify the statement.	4
b)	Mention the differences between "Near Field Photometry" & "Far Field Photometry".	3
c)	How the LOR of any luminaire can be determined using integrating sphere?	4
3.a)	Describe the CIE geometry system of any retroreflector with suitable diagram.	8
b)	What is the physical significance of spherical coordinate system in measurement of luminous intensity?	3
4.a)	Write a short note on photometric test report of any commercial type indoor luminaire.	6
b)	Briefly discuss about the possible systemic and random errors in photometry.	5