

B.E. ELECTRICAL ENGINEERING FOURTH YEAR FIRST SEMESTER EXAM 2024**SUBJECT: - SOLID STATE LIGHTING SYSTEM(HONS.)**

Time: Three hours

Full Marks 100
(50 marks for each part)**Use a separate Answer-Script for each part**

Question No.	PART I ANSWER ANY THREE QUESTIONS QUESTION NO. 1 CARRIES 18 MARKS	Marks
Q. 1.		
(A)	Briefly discuss various physical processes of light generation in electric lamps with suitable examples.	
(B)	What are the different physical processes utilized to generate white light in solid state light sources? Give suitable examples.	
(C)	What do you understand by 'phosphor converted white LED (pc-WLED)'? Draw typical spectral power distribution curves of pc-WLED lamp and tungsten filament lamp and hence compare colour appearance of these lamps.	(6+4+8=18)
Q.2.		
(A)	What are the merits and limitations of LED lamps over the conventional electric lamps?	
(B)	Compare between fluorescent lamp and white LED lamp in view of the above.	
(C)	Compare between cool-white pc-WLED and warm-white pc-WLED in terms of the followings- (i) materials; (ii) colour appearance and (iii) luminous efficacy.	(6+4+6=16)
Q.3.		
(A)	Draw typical V-I characteristics of a pc-WLED and hence explain why it is known as the current controlled lamp, not a voltage controlled lamp.	
(B)	What do you understand by (i) radiative recombination and (ii) non-radiative in case of generation of optical radiation from LEDs? Give examples.	
(C)	Mention the semiconductor materials involved in the generation of red, green and blue light.	(6+6+4=16)
Q.4.		
(A)	How lumen output of a pc-WLED is influenced by its junction temperature? Explain with example.	
(B)	Define thermal resistance for an LED material and explain how junction temperature can be estimated in practice by measuring its solder point temperature.	
(C)	Why suitable thermal management system is essential for high power WLED luminaire?	(4+8+4=16)
Q.5.		
(A)	Discuss the steps of determination of (i) specific colour rendering index and (ii) general colour rendering index of pc-WLED?	
(B)	Explain the R9 issue in case of pc-WLED.	
(C)	What do you understand by Standard Deviation of Colour Matching (SDCM)? Explain with suitable diagram. Why is considered as an important technical specification in case of solid state light sources?	(8+2+6=16)

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PART-II

Answer any *three* questions. 2 marks for organized answer (16 X 3=48+2 = 50)

1. a) Write the fundamental definitions of the following: - LED package, LED array, LED module, LED lamp non-integrated, LED lamp integrated and LED luminaire as defined by ANSI/IESNA RP-16-05. **10**
 b) What is the difference between 2π and 4π geometry of Integrating Sphere based measurement for LEDs? **4**
 c) Write a short note on Lumen maintenance of LED products. **2**

2. a) What do you mean by IES-LM-79-08 standards for LEDs? How this standard is different from IES-LM-80 standard for LEDs? **(4+2= 6)**
 b) What are the different parameters to be included in any LED test report according to the IES-LM-79-08 standard? **10**

3. a) Discuss the different design parameters used as Key Factors of Thermal Management of high Wattage LED luminaires. **13**
 b) Why Thermal Interface Material (TIM) is used between the heat sink and the MCPCB? **3**

4. a) What is the fundamental difference between Passive and Active Current Control of LED? **5**
 b) What are the fundamental advantages and disadvantages of linear LED Driver? **3**
 c) Write a note on Buck-Based LED Drivers. **8**