Reg. No.

MANIPAL MANIPAL A Constituent Institution of Manipal University

MANIPAL INSTITUTE OF TECHNOLOGY

VII EMESTER B.TECH (ELECTRICAL & ELECTRONICS ENGINEERING)

END SEMESTER EXAMINATIONS, NOV 2016

SUBJECT: SOLID STATE LIGHTING & CONTROLS [ELE 4027]

REVISED CREDIT SYSTEM

Time: 3 Hours		s Date: 21 November 2017	MAX. MARKS: 50	
Instru	ctions to	Candidates:		
	✤ Ansv	ver ALL the questions.		
	✤ Miss	ing data may be suitable assumed.		
1A.	Explain topology	the design rules of Type II compensator for a boost converter base y. Draw the closed loop circuit schematic of system with compensator.	d LED driver	(05)
1B.	Explain i manufac	in detail the quality criteria to be considered for the LED luminaire for e cturers claim.	valuating	(05)
2A.	Explain l	light escape cone and its relevance in Luminaire efficiency.		(03)
2B.	Explain t improve	the role of extraction efficiency of LED luminaire and mention the methories it. What is meant by life cycle of photon?	ods to	(04)
2C.	Describe	e the features of DALI and DMX 512 for solid state lighting controls.		(03)

3A. i) Explain the method of white light generation using multicolored LEDs for desired CCT and lumen output.

Four LED samples with color chromaticity coordinates and lumen output specifications are given in table 1. ii) Obtain the color chromaticity coordinates and lumen output of light mixing without dimming.

iii) Calculate the number of LEDs in each color string required for the light output 500lm with optical efficiency 90% and thermal efficiency 85%.

iv) To get the white point chromaticity coordinates x=0.35 and y=0.33. Determine the % duty cycle for each string. Draw the corresponding PWM.

LED	X	у	Y(φ)lm	
R	0.42	0.38	85	
G	0.46	0.39	70	
В	0.47	0.42	70	
Α	0.43	0.41	80	

Table 1. LED sample spec	ifications
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3B. Explain chromaticity diagram; highlight its significance on color mixing and white light generation. (02)

(08)

- **4A.** What is meant by lumen maintenance? Explain the test procedure and lumen maintenance curve.
- **4B.** Draw the thermal resistance model of LED luminaire and mention the general guidelines for the design of heat sink. *(04)*
- **4C.** Why current control method is preferred to drive LED.
- **5A.** What are the factors affecting light output and color stability. Explain compensation of RGB LED luminaire with a neat block diagram.
- **5B.** Refer Table 2, tabulate light output and corresponding Tj for 700mA, and select an LED, for the design of luminaire (same type of LED) which provides a highest output at 70% for 50,000 hrs. Ta=25°C, Rth(j-a)=50°C/w.

Sl.No.	Light o/p(lm)	I(mA)	Multiplication factor for 700mA	Tj (Max)	Life(L70)	Vf (v) at 700mA
1	91	350	1.8	145	50,000 for Tj<130°C	3.2
2	107	350	1.7	150	50,000 for Tj<145°C	3.3
3	130	700	1	125	50,000 for Tj<125°C	3.4
4	100	350	1.65	150	50,000 for Tj<135∘C	3.4

Table	2:	LED	samp	ole s	pecific	ations
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