Reg. No.									

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

(A constituent Institution of MAHE, Manipal)

VII EMESTER B.TECH (ELECTRICAL & ELECTRONICS ENGINEERING)

MAKEUP EXAMINATIONS, DECEMBER 2017

SUBJECT: SOLID STATE LIGHTING AND CONTROLS [ELE 4027]

REVISED CREDIT SYSTEM

Time: 3 Hours **Date: 26 December 2017** **MAX. MARKS: 50**

Instructions to Candidates:

- Answer **ALL** the questions.
- Missing data may be suitable assumed.

1A. Explain the design steps of buck converter and type I compensator for LED driver topology. Explain slope compensation for current mode control with neat diagrams. ***(06)***

1B. Explain in detail any two quality criteria to be considered for the LED luminaire for evaluating manufacturers claim. ***(04)***

2A. Prove from fundamentals that light power escape from the LED structure is identical to the light power in air. ***(06)***

2B. What are the factors affecting life cycle of photon? ***(04)***

3A. Three LED samples with color chromaticity coordinates and lumen output specifications are given in table 1. i) Obtain the color chromaticity coordinates and lumen output of light mixing without dimming.

ii) Calculate the number of LEDs in each color string required for the light output 500lm with optical efficiency 80% and thermal efficiency 80%.

iii)To get the white point chromaticity coordinates x=0.33 and y=0.33. Determine the % duty cycle for each string. Explain pulse width modulation dimming of LED luminaires.

Table 1. LED sample specifications

LED	x	y	Y(ϕ)lm
R	0.42	0.38	85
G	0.46	0.39	70
B	0.47	0.42	70

(08)

3B. Explain binning and its significance on LED lighting ***(02)***

4A. What is meant by lumen maintenance? Explain the test procedure and lumen maintenance curve. ***(04)***

4B. Explain the design factors of heat sink ***(02)***

4C. Describe the features of DALI and DMX 512 for solid state lighting controls. ***(04)***

5A. What are the factors affecting light output and color stability. Explain compensation of RGB LED luminaire with a neat block diagram. ***(04)***

5B. A fixture with 5 LEDs connected in parallel is to be used for designing general lighting luminaire with proper heat management technique. Determine the thermal resistance specification from heat sink to air to ensure maximum ambient and junction temperature of 50°C and 140°C. Given LED data Vf = 3.3V, If = 350mA , Rth(Tj-sp) = 5°C/W and Rth(sp-hs) = 1°C/W. ***(06)***