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# MANIPAL INSTITUTE OF TECHNOLOGY
MANIPAL
*(A constituent Institution of MAHE, Manipal )*

## VII SEMESTER B.TECH (ELECTRICAL & ELECTRONICS ENGINEERING)

## MAKEUP EXAMINATIONS, DECEMBER 2017

## SUBJECT: LIGHTING CONTROLS TECHNOLOGY & APPLICATION [ELE 4022]

REVISED CREDIT SYSTEM

**Time: 3 Hours** **Date: 28 December 2017** **Max. Marks: 50**

**Instructions to Candidates:**

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

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**1A.** With a neat block diagram, clearly explain a lighting control system and its elements. ***(03)***

**1B.** Bring out the role of strategy and devices in lighting control systems. Discuss the following strategies:

a) Adaptive Compensation
b) Lumen Maintenance
c) Time scheduling ***(04)***

**1C.** Explain the difference between Step & Continuous dimming. Give application examples of both. ***(03)***

**2A.** What concerns should be clarified from the manufacturer regarding components in the event of system failure? ***(04)***

**2B.** State the key requirements of ASHRAE 90.1 2010 for daylight harvesting control in commercial buildings. ***(03)***

**2C.** What is Occupant Override? Explain its role in a lighting control system. ***(03)***

**3A.** With respect to control zoning, explain the following;

a) Granularity
b) Layering
c) Role of Photosensors ***(06)***

**3B.** With respect to daylight harvesting, compare the working, merits and demerits of open and closed loop control system. ***(04)***

**4A.** Explain the typical steps involved in commissioning a centralized intelligent lighting control system. ***(05)***

**4B.** What is Thermal Resistance? Calculate the max drive current of a single L.E.D mounted on a FR4 PCB with open vias. Assume its operating junction temperature to be 135°C. Ambient Temperature is 25°C. (Take V=3V, typical luminous flux at 700 mA = 235 lumens)

- Rth (J-C) = 6 K/W
- Rth (FR4 with open vias) = 7 K/W
- Rth (TIM) = 2.5 °C/W.
- Rth (Heat Sink) = 16 K/W.

Find the lumen output of the L.E.D at the operating junction temperature. (Refer Datasheet graphs) ***(05)***

**5A.** A PV array of 500W has been installed to pump water from bore well of 2 meters deep, using a submersible motor & pump system to an overhead tank. The length of the pipe required to pump the water is 30 m. Following are the costs involved for sub systems and their life spans:

PV array- ₹ 400 per watt, life span = 15 years

Motor & Pump system- ₹ 100 per Watt, life span – 8 years

Pipe cost- ₹ 400 per meter; life span – 5 years

Cost of digging bore well – ₹ 500 per meter

Maintenance cost – ₹ 3000 per year

Misc. cost (only at the time of commissioning) : ₹ 100 per Watt

If interest rate is 10% and inflation is 6%, calculate Life cycle cost of the water if the project period is 15 years and also determine annual water cost. ***(05)***

**5B.** With neat waveform(s), explain the working of a low pressure gas discharge lamp. Explain why a ballast is required for the operation of such lamps. ***(05)***

**Datasheet Graphs for Q. 4B**