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MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

A Constituent Institution of Manipal University

VII SEMESTER B.TECH (ELECTRICAL & ELECTRONICS ENGINEERING)

END SEMESTER EXAMINATIONS, NOVEMBER 2017

SUBJECT: LIGHTING CONTROLS TECHNOLOGY & APPLICATION [ELE 4022]

REVISED CREDIT SYSTEM

Time: 3 Hours **Date: 23 November 2017** **Max. Marks: 50**

Instructions to Candidates:

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

1A. What is the difference between lighting control & lighting control system? Clearly explain the benefits of lighting control systems. ***(03)***

1B. Discuss the role of Occupancy & Photo Sensors in control zoning. ***(03)***

1C. With respect to climate change, explain the concept of (i) Mitigation and (ii) Adaptation. Explain the Mitigation options available in order to tackle climate change. ***(04)***

2A. Discuss in detail, the sensor variables required for selecting lighting controls. ***(05)***

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

2C. What is Occupant Override? What are the benefits & drawbacks of occupant override? ***(02)***

3A. Reddy & Kumar Pvt. Ltd are a lighting design & controls consultant with expertise in providing off-grid solutions for office lighting. Their client, Harris Law Firm owns an office space in which twenty number of 72 W Office Troffers housing PL Type lamps, thirty number of 17 W CFL and twenty five number of 22 W L.E.D FTL are used. All lights are switched on for an average of 10 hours a day. In a bid improve energy savings, Reddy & Kumar Pvt Ltd have recommended to replace troffers with 40 W L.E.D based troffers and CFL with 9 W LED down lighters. If the cost of L.E.D down lighter is 750/- per unit, and L.E.D troffer is 8000/- per unit, determine

- Payback period for the recommendation, if cost of energy is 8/- per unit.
- Return on Investment for the recommendation.
- If the project has a life of 5 years, determine the Net Present Value of the project. [Assume k= 8%] ***(05)***

3B. With respect to daylight harvesting, explain the working, merits and demerits of open and closed loop control system. ***(05)***

4A. What is Commissioning? What are the benefits of it? What are the specific activities included in performance testing? ***(05)***

4B. What is Thermal Resistance? Calculate the maximum 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. Explain the working of a Centralized Intelligent Control System. ***(03)***

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)***

5C. What is a control zone? Explain its needs, types and benefits of a control zone. ***(02)***

Datasheet Graphs for Q. 4B