Reg. No.									

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

A Constituent Institution of Manipal University

VII SEMESTER B.TECH (ELECTRICAL & ELECTRONICS ENGINEERING)

END SEMESTER EXAMINATIONS, NOV/DEC 2016

SUBJECT: INTEGRATED LIGHTING DESIGN [ELE 439]

REVISED CREDIT SYSTEM

Time: 3 Hours **Date: 30 November 2016** **MAX. MARKS: 50**

Instructions to Candidates:

- Answer **ANY FIVE FULL** questions.
- Missing data may be suitable assumed.
- Use of lighting design hand book permitted.

1A. Compare the following performance characteristics of HPSV & MH lamp

a) Luminous efficacy
b) CRI
c) Lamp life
d) Lamp Lumen depreciation ***(04)***

1B. Explain the significance of ceiling & wall reflectance's for the following luminaire type used for interior lighting applications

a) Direct luminaire
b) Direct-Indirect luminaire ***(06)***

2. The photometric test report of an Aluminum industrial reflector housing 400W HPSV lamp (Ellipsoidal) is as follows.

ɵ (degrees)	0	10	20	30	40	50	60	70	80
E (Lux)	250	215	140	95	77	56	34	15	6

Test Distance is 8m & S/H_m is 1.5. Ceiling, wall and floor reflectance are maintained to be 50%, 30% & 10% respectively. Work plane height is 1m & luminaire is suspended by 1m from the ceiling. If the dimensions of the room is 24m×12m×6m, determine CU using BZ method. ***(10)***

3. Design an energy efficient lighting system for a fully air conditioned class room of innovation center MIT, Manipal. Select twin lamp CFL luminaire with louvered to illuminate the class room dimensions of 10m x 8m x 3.5m with ceiling, wall and floor reflectance of 70%, 50% and 30% respectively. Periodic cleaning was carried out annually. Use RI method to calculate CU and ensure specific connected load is maintained <10W/m^2. And also estimate final glare index value if the direction of view is parallel to the longer length of the room. Given: DLOR = ULOR = 50%, Luminous area = 2000 sqcm. ***(10)***

4A. Design a suitable flood lighting scheme required to illuminate the upper 50m of a perfectly diffusing surface building of 30m width and 70m height from the ground. An illuminance level of 100 lux is desired. The projectors are to be mounted on towers, at an appropriate distance away from the base of the building. The building surface has major setback features and architectural projections. Direct lighting fixtures are used, but are poorly maintained. Available lamp is 1000W - Metal Halide - Ellipsoidal. If the projectors are designed to produce a wide beam spread of 45 degrees, suggest appropriate location (distance) for mounting them. Show disposition of circular light patches on the building. And also calculate the total energy cost for 1 month (31 days) if lighting system is operated 12hrs/day and cost/unit is 7rs. ***(07)***

4B. What are the important design conditions for road lighting system? ***(03)***

5A. Define the following road lighting parameters.

1. Overhang
2. Zebra effect ***(02)***

5B. Design an energy efficient lighting system using HPSV lamps for a tunnel of length 1km. The road is one way which has a traffic density of 90000 to 150000 AADT. Tunnel has a face dimension of 15m x 8m. Maximum speed limit is 80kmph. Given CU = 0.6, LLF = 0.8, surface reflectance = 0.25 and SSSD = 140m. The luminance level of threshold zone is 260Cd/m^2. Flickering frequency range is 2.5Hz to 15Hz. Ensure spacing between the poles should not exceed 9m to avoid psychological effects. Consider the following design conditions:

1. Luminance level in the first transition zone: 50% of the luminance in threshold zone.
2. Luminance level in the second transition zone: 50% of the luminance in first transition zone.
3. In the interior zone, maintain a luminance level of 50% of luminance in the second transition zone. ***(08)***

6A. Define V, H and M ratios in Side lighting concept. With relevant sketches explain its significance in illuminance distribution pattern. ***(04)***

6B. A photometric test was conducted in lighting measurement lab, Electrical and Electronics Dept, MIT Manipal on 4-11-2016 using Type C Goniophotometer with a test distance of 6m for a given twin lamp (FTL) luminaire manufactured by Philips with dimensions of 1.2m×0,15m×0.07m, Lumen/lamp = 1330 lumens, wattage of the lamp is 14W and Ballast loss/lamp is 2W. The obtained photometric results are given below for horizontal angles 0 and 90 degree respectively. Create an IES file as per the IESNA: LM-63-2002 Standard.

Angle	0	5	10	15	20	25	30	35	40	45	50	55	60	65	70
I (cd)	45	40	36	30	26	22	19	17	15	13	10	08	06	5	01
Angle	0	5	10	15	20	25	30	35	40	45	50	55	60	65	70
I (cd)	46	42	35	31	27	24	21	16	14	11	09	08	05	03	01

(06)