Reg. No.



MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

(A constituent Institution of MAHE, Manipal)

II SEMESTER M.TECH (ENERGY SYSTEMS & MANAGEMENT)

END SEMESTER EXAMINATIONS, APRIL 2018

SUBJECT: INTEGRATED LIGHTING DESIGN [ELE 5201]

REVISED CREDIT SYSTEM

Time	e: 3 Ho	urs Date: 27 April 2018	Max. Marks: 50	0
Instr	uctions	to Candidates:		
	✤ A:	nswer ALL the questions.		
	✤ M	issing data may be suitably assumed.		
	✤ U:	se of Lighting Hand Book is allowed and will be provided from Department		
1A.	Explain for inte	n the significance of ceiling & wall reflectance's for the following luminaire t erior lighting applications	ype used	
	a) b)	Direct luminaire Direct-Indirect luminaire	(06))
1B.	Compa	re the following performance characteristics of HPSV & MH lamp		
	a)	Luminous efficacy		
	b)	CRI		
	c)	Lamp life		
	d)	Lamp Lumen depreciation	(04))
2.	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 reflectances 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/m². 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.
- 3. The photometric test report of an Aluminum industrial reflector housing 400W HPSV lamp (Ellipsoidal) is as follows.

θ (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 reflectances are maintained to be 50%, 30% & 10% respectively. Workplane height is 1m & luminaire is suspended by 1m from the ceiling. If the dimension of the room is 24m×12m×6m, determine CU using BZ method.

(10)

(10)

- **4A.** What are the important design conditions for road lighting system?
- **4B.** Design 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)

- 5A. 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/m². Flickering frequency range is 2.5Hz to 15Hz. 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.

Ensure spacing between the poles should not exceed 9m.

5B. With relevant sketches, Define V, H and M ratios in Side lighting concept.(08)(02)