MANIPAL INSTITUTE OF TECHNOLOGY
MANIPAL
(A constituent unit of MAHE, Manipal)

II SEMESTER M.TECH (ENERGY SYSTEMS & MANAGEMENT)

END SEMESTER EXAMINATIONS, APRIL / MAY 2019

SUBJECT: INTEGRATED LIGHTING DESIGN [ELE 5201)]
REVISED CREDIT SYSTEM

Time: 3 Hours   **Date: 04 May 2019**   **Max. Marks: 50**

Instructions to Candidates:
- ❖ Answer **ALL** the questions.
- ❖ Missing data may be suitably assumed.
- ❖ Use of Lighting Hand Book is allowed and will be provided from Department

1A. What are the different types of interior lighting methods? Elaborate. **(06)**

1B. Explain how RCR, RI and CU varies for the following types of room.

1. Large
2. Small
3. Tall
4. Short

(04)

2. A photometric test report of a particular lamp luminaire combination is as follows: Type of lamp: TL'D', Slim line, 26mm dia – 36W

ɵ (degrees)	0	10	20	30	40	50	60	70	80
Avg. Intensity (Cd/1000lm)	86	92	94	99	101	96	87	75	60

Test Distance is 6m & S/H$_m$ is 1.25. Ceiling, wall and floor reflectances are maintained to be 50%, 30% & 10% respectively. Workplane height is 0.9m & luminaire is suspended by 0.85m from the ceiling. If the dimension of the room is 22m×11m×5m, Estimate utilization factor for the room index of 3. Assume 10 degree zones. **(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 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/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. What are the important design conditions for road lighting system? **(03)**

4B. Design suitable flood lighting scheme required to illuminate the upper 40m of a perfectly diffusing surface building of 20m width and 50m height from the ground. An illuminance level of 150 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 is rough and 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 50 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 leap year if lighting system is operated 11hrs/day and cost/unit is 8rs. **(07)**

5A. Define V, H and M ratios in Side lighting concept. With relevant sketches explain its significance in illuminance distribution pattern **(03)**

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. 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. **(07)**