Reg. No.										

Manipal Institute of Technology, Manipal

(A Constituent Institute of Manipal University)

VII SEMESTER B.TECH (ELECTRICAL & ELECTRONICS ENGINEERING)

MAKE UP EXAMINATIONS, DEC 2015 /JAN 2016

SUBJECT: INTEGRATED LIGHTING DESIGN [ELE 439]

REVISED CREDIT SYSTEM

Time: 3 Hours 05 January 2016 MAX. MARKS: 50

Instructions to Candidates:

- Answer **ANY FIVE FULL** the questions.
- Missing data may be suitable assumed.
- Use of lighting design handbook is permitted

1A. Bring out the comparison between General, Local and Localised General lighting. **6M**

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

a) Large

b) Small

c) Tall

d) Short **4M**

2 A sheet metal workshop with floor dimensions of 20m x 12m has a ceiling height of 5m. Workshop is placed in town outskirts and has annual periodic cleaning. It is to be lit to 300lux using open-end enamel trough reflector housing energy efficient fluorescent tubes. The luminaires are to be fixed with their longer axis parallel to the shorter walls and suspended 0.6m below the ceiling. Given the luminaire ULOR = 12%, luminous area = 3,500cm^2. Reflectance of ceiling & walls is 70% and 50% respectively. The floor is relatively dark. Design the lighting scheme using RI method. Also evaluate final glare index for the worst condition of observation if initial glare value is 17. **10M**

3 The photometric test report of a step integral reflector housing 400W, HPSV Lamp (Ellipsoidal) is as follows. Test distance is 9m.

θ degrees)	0	10	20	30	40	50	60	70
E (lux)	205	165	105	68	38	25	15	04

Given S/Hm = 1.5, Rc = 50%, Rw = 30%, Rf = 30%, ULOR = 0 and Hm = 5.2m. Determine CU for RI of 1.5 assuming 0.9m suspension length for the luminaires. Use BZ method. **10M**

4 A Type C photometric test was conducted in MIT Lighting Measurement laboratory for a Philips Metal Halide lamp housed in a rotational symmetrical luminaire. The intensity distribution is given by the relation $I_\theta = 500(0.3 + \cos\Theta)$. The angle Θ being measured from downward vertical. It emits no light above 100º. If the LOR of the luminaire is 47.8%, calculate the LDL of the lamp. Conventional ballast consuming power of 10% of the lamp wattage is used. Consider zone angle of 10º. Create an IES file for the above luminaire which has a circular face with overall dimension of 0.3m x 0.3m x 0.15m. **10M**

5A. 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 an appropriate distance for mounting them. Show disposition of circular light patches on the building. **5M**

5B. Define the following road lighting parameters.

a) Overall uniformity
b) Surround Ratio
c) Overhang
d) Zebra Effect
e) Spacing distance **5M**

6A. Design a suitable tunnel lighting scheme using HPSV lamps given below for a tunnel of length 500m. The road is dual carriage which has a traffic density of 25000 to 89999 AADT. Tunnel has a face dimension of 15m x 8m. Maximum speed limit is 64kmph. Given CU = 0.6, LLF = 0.8, surface reflectance = 0.25 and SSSD = 90m. The luminance level of threshold zone is 185Cd/m^2. Consider only single transition zone and maintain a luminance level of 30% of the luminance in threshold zone. In the interior zone, maintain a luminance level of 50% of luminance in transition zone. Flickering frequency range is 2.5Hz to 15Hz. Also maintain a single line luminaire arrangement with minimum spacing distance of 0.6m between the luminaires. Luminaire used is circular faced prismatic bowl reflector with face diameter of 0.3m. Available lamps are

a) HPSV, 400W, 47500lm
b) HPSV, 250W, 25000lm
c) HPSV, 150W, 12250lm **7M**

6B. With relevant sketches and graphs, explain the light distributions patterns for different values of 'D' for following Sun control and shading devices.

a) Overhang
b) Louvres **3M**