Ma	(A Constituent Institute of Manipal University)	DWER ASO									
INGFINE	VII SEMESTER B.TECH (ELECTRICAL & ELECTRONICS ENGINEERING)										
	END SEMESTER EXAMINATIONS, NOV/DEC 2015										
	SUBJECT: ILLUMINATION TECHNOLOGY [ELE 405]										
	REVISED CREDIT SYSTEM										
	Time: 3 Hours01 DECEMBER 2015MAX. MARKS: 50										
	Instructions to Candidates:										
	 Answer ANY FIVE FULL questions. Missing data may be suitably assumed. 										
1A.	With reference to spectral eye sensitivity curve, explain the three types of vision.	06									
1B.	Show the inter-relation between the following photometric quantities a. Luminous flux and Luminous intensity b. Illuminance and Luminance.										
_	c. Luminous intensity and Luminance	03									
1C.	Light moving from an optical fiber to air changes wavelength from 430nm to 650nm. What is the speed of light in the fiber?	01									
2A.	A room measuring 5m x 4m x 3m has a lamp with luminous intensity 150Cd hung at the center of room. Assuming the intensity of the light to be uniform in all directions and the lamp is suspended by 0.5m from ceiling, calculate the illuminance due to lamp alone at all 4 corners of the room on the floor. Also calculate the illuminance directly below the lamp and at the midpoints on the walls on the floor.	05									
2B.	What is the total radiant exitance in watt/m ² from a filament of tungsten in incandescent bulb operated at 2500°C? The emissivity constant of tungsten is 0.332.	03									
2C.	Write a short note on a. Color Rendering Index b. Co-related Color Temperature	02									
3A.	Explain about the construction, principle of operation, CCT, CRI and applications of Light Emitting Diode.	06									
3B.	What are the desired functions of luminaire? What is the role of screening devices?	04									

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4. An office with dimensions 20m x 12m x 4m is to be illuminated to 400lux using Twin FTL-TL5 lamp housed in a louvered trough luminaire. Photometric details of the lamp-luminaire is given below (Table 1). Lamp-luminaire is tested using Goniophotometer at a distance of 7m. Design an energy efficient lighting solution using above fixture and show the lighting layout. Given: CU of the luminaire is 0.55, DLOR is 0.77 and LLF is 0.75. Assume S/Hm = 1.25 and zone angle = 10°. Also calculate LPD if the luminous efficacy of the lamp is 93lm/W. If the direction of view is parallel to shorter wall of the room, calculate the Initial Glare Index using the UGR table given below (Table 2).

θ (Degrees)	0	10	20	30	40	50	60	70	80	90
E (lux)	17	22	28	35	29	22	15	10	6	2

Table 1

Х	Y	GI					
6H	4H	17.1					
	6H	17.4					
	8H	17.7					
8H	4H	17.3					
	6H	17.8					
	8H	18.3					

Table 2

5A. A Type C photometric test was conducted for a 70W, 6300lm, HPSV lamp housed in a bowl reflector having circular face of radius 0.15m in MIT Lighting laboratory. Photometric details obtained is in the table given below. Overall height of the luminaire is 0.25m. An electronic ballast consuming 10W is used to drive the lamp. Using the data given, create an IES file for the luminaire.

θ (Degrees)		0	10	20	30	40	50	60	70	80	90
I(Cd) C0		2740	2430	1960	1620	1250	970	790	550	340	160
	C90	2860	2390	1930	1590	1210	940	770	530	310	150

- **5B.** Explain any three of the six basic rules for achieving energy efficiency & cost effectiveness in lighting installations
- **5C.** Explain how reduction in the lighting feeder voltage & use of Electronic Ballast, leads to energy conservation of Lighting Systems.
- **6A.** Design a suitable lighting scheme to illuminate a perfectly diffusing wall of a monument, using floodlighting projectors. The wall is 20m high and 40m wide, and must be lit up to a luminance level of 20Cd/m². The projectors are mounted on a tower, 10m high, located at a distance of 70m from the base of the wall. Assume a diffused reflectance of 40%, C.U of 0.4, WLF= 1.2 and D.F= 1/1.3. Available lamps are
 - a. 1000 W Metal Halide Lamp [Luminous Efficacy = 85 lm/W, CRI = 85]
 - b. 200 W LED lamp [Luminous Efficacy = 110 lm/W, CRI = 80]

The projectors will be lit for ten hours a day, throughout the year. Justify your design. Also, compute the beam spread of the recommended luminaire and show the beam projection on the wall surface.

- **6B.** With neat sketches, explain the basic types of street lighting arrangements suitable for dual carriage ways.
- **6C.** Explain the role of Light Shelves in Daylight Harvesting in Buildings.

03

02

10

05

03

02

05