Q. P. Code: 26314

(3 hours) **[Max marks: 80]**

N.B.: 1. **Q 1** is **compulsory**
2. Answer **any Three** out of remaining **Five** questions
3. Assumptions made should be clearly stated
4. Assume any suitable data wherever required but justify the same

1 Answer the following:
(a) State 'Laws of illumination', and explain with the help suitable diagrams. What are the important illumination parameters used in lighting design? Explain each one of them. **10**
(b) Explain the term 'glare' in the context of lighting. Explain means of evaluating and minimizing the glare in actual practice. **05**
(c) Draw a schematic of a dimming ballast for fluorescent lamp and explain. **05**

2 (a) Compare the various electrical/ photometric characteristics and features of Metal Halide lamp, Induction lamp and LED lamp. **10**
(b) Describe the following in the context of the luminaries used for LED lamps **10**
(i) Control gear (ii) Optical control

3 (a) Consider an air-conditioned reputed brand garment store located in a commercial mall with total area of 50mt x 50mt x 4.5mt. Prepare the layout of the centre as per your understanding identifying various sections in the shop. Describe the design consideration for various sections. And then design lighting system for one of the main sections. Draw all the necessary layouts and sketches. Refer the data provided. If necessary assume any additional data with proper justification given. **14**
(b) Explain the design considerations for lighting design for indoor sports center with the help of suitable examples. **06**

4 (a) For a outdoor car parking area, select suitable lamp and luminaire. Justify your selection. The covered area is 100 mt x 100 mt x 5.0 mt. Using average illumination method estimate the number of lamps required to provide illumination of 70 lux on the working plane. Use the lamp and luminaire data provided if necessary. **10**
(b) What are the various standards used in illuminations engineering? Briefly describe them. **05**
(c) Explain the role of lighting control schemes in achieving energy efficient lighting design. **05**

5 (a) Explain the following in the context lighting control: **12**
(i) DMX controller (ii) Smart Lighting Fixtures
(iii) BACnet
(b) Explain the solar powered LED lighting for indoor and outdoor application. **08**

6 (a) Design the lighting scheme for a major road having two way light traffic. The specifications are as follows: Total width of the road = 20 meters (6 lanes); width of the divider = 2 meters and straight stretch of the road = 5 km. Specify all quantitative and qualitative design considerations for the above applications. Clearly specify the selection and justification for: **14**
(i) Type of arrangements of poles (ii) Lamps and luminaries (iii) Pole height and spacing
(iv) Number of poles and lamps (v) Electrical load per kilometer of lighting scheme

(b) Explain how the solid state lighting has changed the illumination engineering applications. What are the main challenges faced in the current state of the art for solid state lighting and what are the means of mitigating the same? **06**

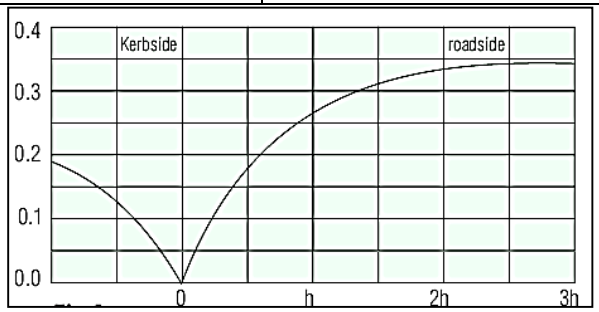
Data for Illumination Design problems

Coefficient of Utilization Chart

K	Rc=0.7			Rc=0.5			Rc=0.3		
	Rw=0.5	Rw=0.3	Rw=0.1	Rw=0.5	Rw=0.3	Rw=0.1	Rw=0.5	Rw=0.3	Rw=0.1
0	0	0	0	0	0	0	0	0	0
0.6	0.43	0.39	0.36	0.42	0.38	0.36	0.41	0.38	0.36
0.8	0.45	0.41	0.38	0.44	0.40	0.38	0.43	0.40	0.38
1.00	0.51	0.47	0.44	0.55	0.47	0.44	0.49	0.46	0.40
1.25	0.55	0.51	0.49	0.53	0.50	0.48	0.52	0.50	0.48
1.50	0.57	0.54	0.52	0.56	0.53	0.51	0.54	0.52	0.50
2.00	0.61	0.58	0.56	0.59	0.57	0.55	0.57	0.56	0.54
2.50	0.63	0.61	0.59	0.61	0.59	0.57	0.59	0.58	0.56
3.00	0.65	0.63	0.61	0.63	0.61	0.59	0.61	0.59	0.58
4.00	0.67	0.65	0.63	0.64	0.63	0.62	0.62	0.61	0.59
5.00	0.68	0.67	0.65	0.65	0.64	0.63	0.63	0.62	0.61

Lamp Data

Sr.No	Type of Lamp	Wattage	Lumen output
1	GLS	40 60 100	415 710 1340
2	Tungsten Halogen	50 (Miniature Dichroic) 500 1000	900 9000 22000
3	Fluorescent (T8/ T5)	18 (82/84/86) 36(82/84/86) 28(T5) (82/84/86)	1300 3250 2800
4	CFL	11 18 26 36	760 1200 1800 2600
5	HPMV	125 250 400	6200 12700 22000
6	Metal Halide	70 150 250	5500 12100 20000
7	HPSV	70 150 250 400	5800 13500 25000 47000
	LED lamps (Warm/ Intermediate / Cool white)	20 40 60 100	1500 3250 5400 10000



Utilization Factor Curve for road lighting design