Reg. No.



VII SEMESTER B.TECH (ELECTRICAL & ELECTRONICS ENGINEERING) END SEMESTER EXAMINATIONS, NOVEMBER 2019

SUBJECT: LIGHTING CONTROLS: TECHNOLOGY AND APPLICATION [ELE 4022]

REVISED CREDIT SYSTEM

Time	e: 3 Hours Date: 23, Novemb	per 2019	Max. Marks: 50					
Instructions to Candidates:								
	 Answer ALL the questions. 							
	Missing data may be suitably assumed.							
1A.	Discuss in detail the various lighting control strategies and technologies (09)							
1B.	Explain with neat sketches, the coverage area and pattern of PIR, Ultrasonic and dual							
	technology occupancy sensors.		(05)					
2A.	With neat sketches, explain spatial and spectral re	sponse of a photosensor.	(04)					
2B.	Discuss the development of camera as a luminan	ce sensor and the control	of daylight-					
	artificial light integrated scheme.		(04)					
2C.	Explain with neat sketches, the PWM dimming for	LED luminaire.	(02)					
3A.	Highlight the device types, topologies and benefits	of mesh networking for ligh	ting control					
	schemes.	0 0	(04)					
3B.	Estimate the solar altitude and daylight on the wight ground reflectance factor of 0.2, the measured s	ndow facing south, by consolar irradiation of 600 wat	sidering the ts/m², local					

standard time at 9:30 AM, day of the year 81, and constant parameter of 0.7513.

Site Longitude & Latitude : 74°E &13°N

ε	F11	F12	F13	F21	F22	F23
1.056	-0.011	0.748	-0.08	-0.048	0.073	-0.024
1.253	-0.038	1.115	-0.109	-0.023	0.106	-0.037
1.586	0.166	0.909	-0.179	0.062	-0.021	-0.05
2.134	0.419	0.646	-0.262	0.14	-0.167	-0.042
3.23	0.71	0.025	-0.29	0.243	-0.511	-0.004
5.98	0.857	-0.37	-0.279	0.267	-0.792	0.076
10.08	0.734	-0.073	-0.228	0.231	-1.18	0.199
999999	0.421	-0.661	0.097	0.119	-2.125	0.446

Table, 1

- 4. For the room with dimensions 7.8m x 8.4m x 3.2m, shown in Fig.1
 - i) Design luminaire disposition to provide 500lux uniformly for the luminaire details given in Table. 2, CU=0.9, MF=0.9, estimate LPD and Energy performance index.
 - ii) Mark the primary and secondary daylighting zones, Windows at 0.8 m above the floor and width of the window is 1.8m and height of the window is 2.4m.

(10)

(06)

- With scheduled occupancy and photosensor based lighting control, find Energy performance index. [Lab timings: 9 to 12 & 2 to 5 pm, break time 12 to 2 pm (all off)]. Photosensor average light dependency factor 0.8. Photosensors are placed in the primary daylighting zones.
- iv) Calculate the Payback period with control when the additional cost of sensor integrated luminaire and control is Rs. 1000/luminaire. cost/ kWh is Rs. 8, working for 300 days.
- v) For the measured task illuminance of 400 lux, find the dimming factor
- vi) For the Venetian blind position of 70% open, find the average interior daylight in the primary zone and secondary zone for average daylight on window of 8000 lux.
- **5A.** For the room Layout shown in Fig .1, wall, ceiling and floor reflectance are 70, 60 and 20 percentage. Luminaire details are given in Table 2. With respect to LEED compliance, Comment on the following.



- i) Connected load in terms of the distribution of light ii) Connected load in terms of glare-free light iii) Connected load with lamp life requirement iv) Window Wall Ratio (WWR) v) Estimate average surface reflectance for the ceiling, wall and floor vi) Illuminance ratio (in general) vii) CRI
- **5B.** Explain light pollution in compliance with LEED certification.



(07) (03)