

BACHELOR OF ELECTRICAL ENGG. FOURTH YEAR FIRST SEMESTER EXAMINATION, 2018

(4th Year, 1st Semester)

ELECTIVE-I (ADVANCED ILLUMINATION ENGG.)

Time : Three hours

Full Marks : 100

(50 marks for each part)

Use separate Answer-script for each part

PART – I

Neatness carries 2(two)marks

Answer any Three

1.(a)A 36W fluorescent lamp and a magnetic choke are connected in series across a 230 V r.m.s, 50 Hz supply.

i) Draw its circuit diagram with glow starter and one power factor improving capacitor..
ii) Find out the inductance of the ballast when the following r.m.s. measurements were obtained :Vlamp = 107 V,

$$I = 411 \text{ mA}, P_{\text{lamp}} = 36 \text{ W}, P_{\text{ballast}} = 8 \text{ W}.$$

iii) Draw necessary vector diagrams.

iv)What value of capacitor will be used to obtain unity power factor? 8

(b)Write short notes on (any four): 4x2=8

(i) Self Absorption Phenomenon

(ii)Ambipolar Diffusion

(iii)Glass-metal seal,

(iv)Penning mixture,

(v) Resonance radiation imprisonment

2.(a) Describe the production of radiation in low Pressure Mercury vapour lamp. 4

(b)What are the functions of buffer gases? 4

(c) What is meant by “Direct Ratio” of a luminaire? Describe it with formula. 2

(d)Discuss the necessity of Non-planar Illuminance in Lighting Design.Compare Spherical and Cylindrical Illuminance with suitable diagrams and explain them . 2+4=6

3. (a)Two same types of lamps (Intensity Distribution Chart is given in Table 1) are suspended from the ceiling with 1' suspension string. The height of the room is 12'. The length of the room is 27' and the width is 16'. The 16' wide walls hold the rod in which luminaires are mounted. The rod is fixed at the middle position of this wall. Find the illuminance at the centre of the 27' ×12' wall. The luminaires are spaced at 9' and the distance from the wall to each luminaire is also 9'. 8

Table 1 : Intensity Distribution Chart

θ in degrees	5	15	25	35	45	55	65	75	85
I in Candelas	1500	1450	1370	1270	1040	710	460	330	220
θ in degrees	95	105	115	125	135	145	155	165	175
I in Candelas	125	180	175	172	112	100	92	50	25

[Turn over

(b) "The effective cavity reflectance of a particular shaped ceiling (other than flat) does not depend on its dimension." Justify this statement with proper example. 4

(c) Explain the method of selection of the illuminance value of a particular place from the ranges of values given in IS3646 with any one practical example. 4

4.(a) A room of 34' length and 24' width is illuminated with suspended direct type retrofit LED luminaire. The reflectances of ceiling surface is 80% , wall surface of the ceiling cavity is 90%, wall surface below the luminaires is 50%, wall from floor to working plane is 10% and floor reflectance is 30%. If the distance of the lamp to ceiling is 2ft. 4 inches, the distance of the lamp to working plane is 7ft. 8 inches, and the distance between the working plane and floor is 2ft. 6 inches.

i) Find out the effective ceiling and effective floor cavity reflectances.

ii) Choose the correct luminaire from the given Table and find out the CU value of the luminaire.

iii) How many luminaires are required to illuminate the room with average 150 lux? (Use 18W LED with 90 lm/W efficacy.)

iv) Show their spacing arrangement.

Given: Lamp lumen depreciation factor=0.8, Lumen dirt depreciation factor=0.7, Room surface dirt depreciation factor=0.8

(Use the given charts)

12

(b) Explain the Dynamic V-I characteristic of a low pressure gas discharge lamp necessary curves .

4

Table I Per Cent Effective Ceiling or Floor Cavity Reflectances for Various Reflectance Combinations

Per Cent Basset Reflectance	80										70										60										50									
	90	80	70	60	50	40	30	20	10	0	90	80	70	60	50	40	30	20	10	0	90	80	70	60	50	40	30	20	10	0	90	80	70	60	50	40	30	20	10	0
Per Cent VVM Reflectance	90	80	70	60	50	40	30	20	10	0	90	80	70	60	50	40	30	20	10	0	90	80	70	60	50	40	30	20	10	0	90	80	70	60	50	40	30	20	10	0
Cavity Ratio	0.2	0.4	0.6	0.8	1.0	1.2	1.4	1.6	1.8	2.0	2.2	2.4	2.6	2.8	3.0	3.2	3.4	3.6	3.8	4.0	4.2	4.4	4.6	4.8	5.0	6.0	7.0	8.0	9.0	10.0										
80	89	87	85	83	81	79	77	75	73	71	88	86	84	82	80	78	76	74	72	70	87	85	83	81	79	77	75	73	71	69	86	84	82	80	78	76	74	72	70	68
70	88	86	84	82	80	78	76	74	72	70	87	85	83	81	79	77	75	73	71	69	86	84	82	80	78	76	74	72	70	68	85	83	81	79	77	75	73	71	69	67
60	87	85	83	81	79	77	75	73	71	69	86	84	82	80	78	76	74	72	70	68	85	83	81	79	77	75	73	71	69	67	84	82	80	78	76	74	72	70	68	66
50	86	84	82	80	78	76	74	72	70	68	85	83	81	79	77	75	73	71	69	67	84	82	80	78	76	74	72	70	68	66	83	81	79	77	75	73	71	69	67	65
40	85	83	81	79	77	75	73	71	69	67	84	82	80	78	76	74	72	70	68	66	83	81	79	77	75	73	71	69	67	65	82	80	78	76	74	72	70	68	66	64
30	84	82	80	78	76	74	72	70	68	66	83	81	79	77	75	73	71	69	67	65	82	80	78	76	74	72	70	68	66	64	81	79	77	75	73	71	69	67	65	63
20	83	81	79	77	75	73	71	69	67	65	82	80	78	76	74	72	70	68	66	64	81	79	77	75	73	71	69	67	65	63	80	78	76	74	72	70	68	66	64	62
10	82	80	78	76	74	72	70	68	66	64	81	79	77	75	73	71	69	67	65	63	80	78	76	74	72	70	68	66	64	62	79	77	75	73	71	69	67	65	63	61
0	81	79	77	75	73	71	69	67	65	63	80	78	76	74	72	70	68	66	64	62	79	77	75	73	71	69	67	65	63	61	78	76	74	72	70	68	66	64	62	60

* Values in this table are based on a length to width ratio of 1.0.
† Ceiling, floor or floor of cavity.

Table I - Continued*

Per Cent Blanket Reflectance	40										30										20										10										0									
	80	80	70	60	50	40	30	20	10	0	90	80	70	60	50	40	30	20	10	0	90	80	70	60	50	40	30	20	10	0	90	80	70	60	50	40	30	20	10	0	90	80	70	60	50	40	30	20	10	0
Cavity Ratio	0.2	0.4	0.6	0.8	1.0	1.2	1.4	1.6	1.8	2.0	2.2	2.4	2.6	2.8	3.0	3.2	3.4	3.6	3.8	4.0	4.2	4.4	4.6	4.8	5.0	5.2	5.4	5.6	5.8	6.0	6.2	6.4	6.6	6.8	7.0	7.2	7.4	7.6	7.8	8.0	8.2	8.4	8.6	8.8	9.0	9.2	9.4	9.6	9.8	10.0
Per Cent Wall Reflectance	0.2	0.4	0.6	0.8	1.0	1.2	1.4	1.6	1.8	2.0	2.2	2.4	2.6	2.8	3.0	3.2	3.4	3.6	3.8	4.0	4.2	4.4	4.6	4.8	5.0	5.2	5.4	5.6	5.8	6.0	6.2	6.4	6.6	6.8	7.0	7.2	7.4	7.6	7.8	8.0	8.2	8.4	8.6	8.8	9.0	9.2	9.4	9.6	9.8	10.0
Per Cent Blanket Reflectance	0.2	0.4	0.6	0.8	1.0	1.2	1.4	1.6	1.8	2.0	2.2	2.4	2.6	2.8	3.0	3.2	3.4	3.6	3.8	4.0	4.2	4.4	4.6	4.8	5.0	5.2	5.4	5.6	5.8	6.0	6.2	6.4	6.6	6.8	7.0	7.2	7.4	7.6	7.8	8.0	8.2	8.4	8.6	8.8	9.0	9.2	9.4	9.6	9.8	10.0
Per Cent Wall Reflectance	0.2	0.4	0.6	0.8	1.0	1.2	1.4	1.6	1.8	2.0	2.2	2.4	2.6	2.8	3.0	3.2	3.4	3.6	3.8	4.0	4.2	4.4	4.6	4.8	5.0	5.2	5.4	5.6	5.8	6.0	6.2	6.4	6.6	6.8	7.0	7.2	7.4	7.6	7.8	8.0	8.2	8.4	8.6	8.8	9.0	9.2	9.4	9.6	9.8	10.0

* Values in this table are based on a length to width ratio of 1.6.
† Ceiling, floor or floor of cavity.

TABLE II
Coefficients of Utilization


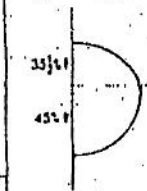
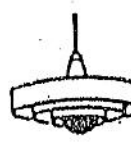
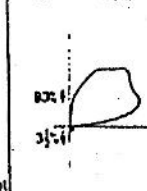

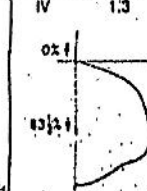
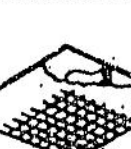
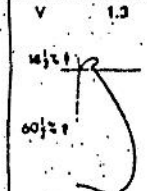
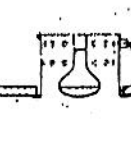
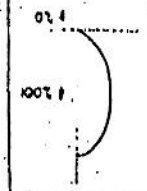

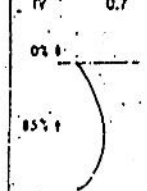
Typical Luminaire	Typical Intensity Distribution and Per Cent Lamp Lumens	R _{cc} →	Coefficients of Utilization for 20 Per Cent Effective Floor-Cavity Reflectance (ρ _{av} = 20)															R _{CR} ↓				
			00°		70°			50°			30°			10°			0°					
	Maint. Cat.	SC	R _{CR} ↓	50°	30°	10°	50°	30°	10°	50°	30°	10°	50°	30°	10°	50°	30°	10°	0°	0°	R _{CR} ↓	
 Pendant diffusing sphere with incandescent lamp		1.5	0	.87	.87	.87	.81	.81	.81	.70	.70	.70	.59	.59	.59	.49	.49	.49	.45			1
			1	.71	.66	.62	.65	.61	.58	.55	.52	.49	.46	.44	.42	.38	.36	.34	.30	.388		2
			2	.60	.53	.46	.55	.50	.45	.47	.42	.39	.39	.36	.32	.31	.29	.26	.23	.279		3
			3	.52	.44	.38	.48	.41	.36	.40	.35	.31	.33	.29	.26	.27	.24	.21	.18	.227		4
			4	.45	.37	.32	.42	.35	.29	.35	.30	.25	.29	.25	.21	.23	.20	.17	.14	.192		5
			5	.40	.32	.27	.37	.30	.25	.31	.25	.21	.28	.21	.18	.21	.17	.14	.12	.168		6
			6	.35	.28	.23	.33	.26	.21	.28	.22	.18	.23	.19	.15	.19	.15	.12	.10	.148		7
			7	.32	.25	.19	.29	.23	.18	.25	.20	.16	.21	.18	.13	.17	.13	.11	.09	.130		8
			8	.29	.22	.17	.27	.20	.16	.23	.17	.14	.19	.15	.12	.15	.12	.09	.07	.117		9
			9	.26	.19	.15	.24	.18	.14	.21	.16	.12	.17	.13	.10	.14	.11	.08	.07	.107		10
			10	.24	.17	.13	.22	.16	.12	.19	.14	.11	.16	.12	.09	.13	.10	.08	.06	.098		10
 Concentric ring unit with incandescent silvered-bowl lamp		N.A.	0	.83	.83	.83	.72	.72	.72	.50	.50	.50	.30	.30	.30	.12	.12	.12	.03			1
			1	.72	.69	.66	.62	.60	.57	.43	.42	.40	.28	.25	.25	.10	.10	.10	.03	.018		2
			2	.63	.58	.54	.54	.50	.47	.36	.35	.33	.23	.22	.20	.09	.08	.06	.02	.015		3
			3	.55	.49	.45	.47	.43	.39	.33	.30	.28	.20	.19	.17	.08	.07	.07	.02	.013		4
			4	.48	.42	.37	.42	.37	.33	.29	.26	.23	.18	.16	.15	.07	.06	.06	.02	.012		5
			5	.43	.38	.32	.37	.32	.28	.26	.23	.20	.16	.14	.12	.06	.05	.05	.01	.011		6
			6	.38	.32	.27	.33	.28	.24	.23	.20	.17	.14	.12	.11	.05	.04	.04	.01	.010		7
			7	.34	.29	.23	.30	.24	.21	.21	.17	.15	.13	.11	.09	.05	.04	.04	.01	.009		8
			8	.31	.25	.20	.27	.21	.18	.19	.15	.13	.12	.10	.08	.05	.04	.03	.01	.008		9
			9	.28	.22	.18	.24	.19	.16	.17	.14	.11	.10	.09	.07	.04	.03	.03	.01	.006		10
			10	.25	.20	.16	.22	.17	.14	.16	.12	.10	.10	.08	.06	.04	.03	.03	.01	.007		10
 Porcelain-enamelled ventilated standard dome with incandescent lamp		1.3	0	.99	.99	.99	.97	.97	.97	.93	.93	.93	.89	.89	.89	.85	.85	.85	.83			1
			1	.87	.84	.81	.85	.82	.79	.82	.79	.77	.79	.76	.74	.78	.74	.72	.71	.323		2
			2	.76	.70	.65	.74	.69	.65	.71	.67	.63	.69	.65	.62	.64	.63	.60	.59	.311		3
			3	.66	.59	.54	.65	.59	.53	.62	.57	.53	.60	.56	.52	.59	.54	.51	.49	.288		4
			4	.58	.51	.45	.57	.50	.45	.55	.49	.44	.53	.46	.44	.51	.47	.43	.41	.264		5
			5	.52	.44	.39	.51	.44	.38	.49	.43	.39	.47	.42	.37	.48	.41	.37	.35	.241		6
			6	.46	.39	.33	.46	.38	.33	.44	.38	.33	.43	.37	.33	.41	.34	.32	.31	.221		7
			7	.42	.34	.28	.41	.34	.29	.40	.33	.29	.39	.33	.29	.38	.32	.28	.27	.203		8
			8	.38	.31	.26	.37	.31	.26	.36	.30	.26	.35	.30	.26	.34	.29	.25	.24	.187		9
			9	.36	.28	.23	.34	.28	.23	.33	.27	.23	.32	.27	.23	.32	.26	.23	.21	.173		10
			10	.32	.25	.21	.32	.25	.21	.31	.25	.21	.30	.24	.21	.29	.24	.20	.19	.161		10
 Prismatic square surface luminaire		1.3	0	.89	.89	.89	.85	.85	.85	.77	.77	.77	.70	.70	.70	.63	.63	.63	.60			1
			1	.77	.74	.71	.74	.71	.68	.67	.65	.63	.61	.59	.57	.55	.54	.53	.50	.264		2
			2	.68	.63	.59	.65	.61	.57	.59	.56	.53	.54	.51	.49	.49	.47	.45	.42	.224		3
			3	.61	.55	.50	.58	.53	.48	.53	.48	.45	.49	.45	.42	.44	.42	.39	.37	.197		4
			4	.54	.48	.43	.52	.46	.42	.48	.43	.39	.44	.40	.37	.40	.37	.34	.32	.176		5
			5	.49	.42	.38	.47	.41	.37	.43	.38	.35	.40	.36	.33	.37	.33	.31	.29	.159		6
			6	.44	.38	.33	.43	.37	.32	.39	.34	.31	.36	.32	.29	.34	.30	.27	.26	.145		7
			7	.40	.34	.30	.39	.33	.29	.36	.31	.27	.33	.29	.26	.31	.27	.25	.23	.133		8
			8	.37	.31	.27	.36	.30	.26	.33	.28	.25	.31	.27	.24	.29	.25	.22	.21	.124		9
			9	.34	.28	.24	.33	.27	.24	.31	.26	.22	.29	.24	.21	.27	.23	.20	.19	.115		10
			10	.32	.26	.22	.30	.25	.21	.28	.24	.21	.27	.23	.20	.25	.21	.19	.17	.106		10
 R-40 flood without shielding		0.8	0	1.19	1.19	1.19	1.16	1.16	1.16	1.11	1.11	1.11	1.06	1.06	1.06	1.02	1.02	1.02	1.00			1
			1	1.08	1.05	1.03	1.06	1.03	1.01	1.02	1.00	.98	.99	.97	.95	.95	.93	.92	.90	.241		2
			2	.99	.94	.89	.97	.92	.88	.93	.90	.86	.90	.87	.84	.88	.85	.83	.81	.238		3
			3	.90	.84	.79	.88	.83	.78	.86	.81	.77	.83	.79	.76	.81	.77	.74	.73	.227		4
			4	.82	.75	.70	.81	.75	.70	.79	.73	.69	.77	.72	.68	.75	.71	.67	.66	.215		5
			5	.78	.68	.63	.75	.68	.63	.73	.67	.62	.71	.66	.62	.69	.65	.61	.59	.202		6
			6	.70	.62	.57	.69	.62	.57	.67	.61	.57	.66	.60	.56	.64	.60	.56	.54	.191		7
			7	.65	.57	.52	.64	.57	.52	.62	.56	.52	.61	.56	.52	.60	.55	.51	.50	.180		8
			8	.60	.53	.48	.59	.53	.48	.58	.52	.48	.57	.52	.47	.58	.51	.47	.46	.169		9
			9	.56	.49	.44	.55	.49	.44	.54	.48	.44	.53	.48	.44	.52	.47	.44	.42	.160		10
			10	.52	.46	.41	.52	.45	.41	.51	.45	.41	.50	.45	.41	.49	.44	.41	.39	.152		10
 R-40 flood with specular anodized reflector, 54x11, 45° cutoff		0.7	0	1.01	1.01	1.01	.99	.99	.99	.94	.94	.94	.90	.90	.90	.87	.87	.87	.85			1
			1	.85	.83	.81	.83	.81	.79	.89	.88	.87	.88	.85	.84	.83	.82	.82	.80	.115		2
			2	.86	.86	.83	.87	.84	.82	.85	.82	.80	.82	.80	.78	.80	.78	.77	.76	.115		3
			3	.83	.80	.77	.82	.79	.76	.80	.77	.73	.78	.76	.74	.78	.74	.72	.71	.113		4
			4	.79	.74	.71	.78	.74	.71	.76	.73	.70	.74	.71	.69	.73	.70	.68	.67	.110		5
			5	.74	.70	.67	.74	.69	.66	.72	.68	.66	.71	.68	.65	.69	.67	.65	.63	.107		6
			6	.70	.66	.62	.70	.65	.62	.68	.65	.62	.67	.64	.61	.66	.63	.61	.60	.104		7
			7	.67	.62	.59	.66	.62	.59	.65	.61	.58	.64	.61	.58	.63	.60	.58	.57	.100		8
			8	.63	.59	.56	.63	.58	.55	.62	.58	.55	.61	.58	.55	.60	.57	.55	.54	.097		9
			9	.60	.56	.53	.60	.56	.53	.59	.55	.52	.58	.55	.52	.58	.54	.52	.51	.094		10
			10	.57	.53	.50	.57	.53	.50	.56	.52	.50	.56	.52	.50	.55	.52	.49	.48	.091		10

Table II - Continued
Coefficients, Luminaire Spacing Criterion and Maintenance Categories of Typical Luminaires.

80									70									50									30									10																																																																																																																																																																																																											
50			30			10			50			30			10			50			30			10			50			30			10			50			30			10																																																																																																																																																																																																					
Wall Exitance Coefficients for 20 Per Cent Effective Floor Cavity Reflectance ($\rho_{cc} = 20$)																		Ceiling Cavity Exitance Coefficients for 20 Per Cent Floor Cavity Reflectance ($\rho_{cc} = 20$)																																																																																																																																																																																																																													
.328	.187	.059	.311	.178	.056	.280	.161	.051	.252	.145	.047	.226	.131	.042	.423	.423	.423	.361	.361	.361	.246	.246	.246	.142	.142	.142	.045	.045	.045	.422	.396	.373	.361	.340	.321	.247	.234	.222	.142	.136	.129	.046	.044	.042	.417	.379	.347	.357	.327	.300	.245	.226	.209	.141	.131	.123	.045	.043	.040	.412	.367	.332	.353	.317	.287	.242	.220	.202	.140	.128	.119	.045	.042	.039	.406	.358	.321	.348	.309	.279	.239	.215	.196	.138	.126	.116	.045	.041	.038	.400	.350	.314	.343	.303	.273	.236	.212	.193	.137	.124	.114	.044	.041	.038	.394	.344	.309	.336	.298	.269	.234	.209	.190	.135	.123	.113	.044	.040	.037	.388	.339	.305	.334	.294	.266	.231	.206	.188	.134	.122	.112	.043	.040	.037	.383	.335	.302	.330	.291	.264	.228	.204	.187	.133	.120	.111	.043	.039	.037	.378	.332	.300	.326	.288	.262	.226	.202	.186	.131	.119	.111	.043	.039	.037	.374	.328	.298	.322	.285	.260	.223	.201	.185	.130	.118	.110	.042	.039	.037																																																												
.226	.128	.041	.195	.111	.035	.137	.078	.025	.083	.048	.015	.034	.020	.008	.796	.796	.796	.680	.680	.680	.464	.464	.464	.267	.267	.267	.085	.085	.085	.790	.772	.756	.676	.663	.651	.462	.456	.450	.266	.264	.262	.085	.085	.085	.784	.755	.731	.671	.650	.632	.462	.450	.441	.265	.262	.258	.085	.085	.084	.778	.743	.715	.667	.641	.620	.455	.445	.435	.265	.260	.256	.085	.084	.084	.773	.734	.703	.664	.634	.611	.456	.442	.430	.264	.259	.255	.085	.084	.084	.768	.726	.696	.660	.629	.605	.455	.439	.427	.263	.258	.253	.085	.084	.084	.764	.721	.690	.656	.624	.601	.453	.437	.425	.263	.257	.253	.085	.084	.083	.759	.716	.686	.653	.621	.598	.451	.435	.423	.262	.256	.252	.085	.084	.083	.755	.712	.683	.650	.618	.595	.450	.434	.422	.262	.256	.252	.085	.084	.083	.751	.709	.680	.647	.615	.593	.448	.432	.421	.261	.255	.251	.085	.084	.083	.747	.706	.678	.644	.613	.592	.447	.431	.421	.261	.255	.251	.084	.084	.083																																																												
.248	.141	.045	.242	.138	.044	.231	.133	.042	.221	.126	.041	.212	.123	.040	.159	.159	.159	.136	.136	.136	.093	.093	.093	.053	.053	.053	.017	.017	.017	.150	.130	.113	.126	.112	.097	.068	.077	.067	.050	.045	.039	.016	.014	.013	.143	.110	.082	.123	.095	.071	.064	.066	.050	.048	.038	.029	.016	.012	.009	.137	.095	.062	.118	.082	.054	.061	.057	.036	.047	.033	.022	.015	.011	.007	.131	.084	.048	.113	.073	.042	.077	.051	.030	.045	.030	.018	.014	.010	.006	.125	.078	.039	.108	.065	.034	.074	.046	.024	.043	.027	.014	.014	.009	.005	.120	.076	.038	.107	.063	.037	.074	.042	.020	.041	.025	.012	.013	.008	.004	.115	.074	.037	.106	.062	.036	.073	.042	.020	.041	.025	.012	.013	.008	.004	.110	.072	.037	.105	.062	.036	.072	.042	.021	.040	.025	.012	.013	.008	.004	.105	.070	.036	.104	.061	.035	.071	.042	.021	.039	.023	.010	.013	.007	.003	.100	.069	.035	.103	.060	.034	.070	.042	.021	.038	.023	.010	.013	.007	.003	.095	.067	.034	.102	.059	.033	.069	.042	.021	.037	.023	.010	.013	.007	.003	.090	.066	.033	.101	.058	.032	.068	.042	.021	.036	.023	.010	.013	.007	.003	.085	.065	.032	.100	.057	.031	.067	.042	.021	.035	.023	.010	.013	.007	.003	.080	.064	.031	.099	.056	.030	.066	.042	.021	.034	.023	.010	.013	.007	.003
.243	.138	.044	.232	.132	.042	.211	.121	.039	.192	.111	.036	.175	.101	.033	.290	.290	.290	.248	.248	.248	.169	.169	.169	.097	.097	.097	.031	.031	.031	.283	.264	.247	.242	.227	.213	.166	.156	.147	.095	.090	.085	.031	.029	.028	.276	.240	.221	.236	.212	.191	.162	.147	.133	.093	.085	.078	.030	.028	.025	.269	.233	.204	.231	.201	.177	.158	.139	.124	.092	.081	.073	.029	.026	.024	.263	.223	.192	.226	.192	.167	.155	.134	.117	.090	.079	.069	.029	.026	.023	.257	.215	.183	.221	.186	.160	.152	.130	.113	.088	.076	.067	.028	.025	.022	.252	.208	.177	.216	.180	.154	.149	.126	.109	.087	.074	.065	.028	.024	.021	.246	.203	.173	.212	.176	.151	.146	.123	.107	.085	.073	.063	.027	.024	.021	.242	.199	.169	.208	.172	.148	.144	.121	.105	.084	.071	.062	.027	.023	.021	.237	.195	.166	.204	.169	.145	.142	.119	.103	.083	.070	.061	.027	.023	.020	.233	.192	.164	.201	.167	.143	.139	.117	.102	.081	.069	.061	.026	.023	.020																																																												
.220	.125	.040	.213	.122	.039	.200	.115	.037	.189	.109	.035	.178	.103	.033	.190	.190	.190	.163	.163	.163	.111	.111	.111	.064	.064	.064	.020	.020	.020	.174	.157	.141	.149	.135	.122	.102	.093	.084	.059	.054	.049	.019	.017	.016	.161	.132	.107	.139	.114	.093	.095	.079	.065	.055	.048	.038	.018	.015	.012	.151	.114	.084	.130	.098	.073	.069	.068	.051	.051	.040	.030	.017	.013	.010	.142	.100	.067	.122	.086	.058	.064	.060	.041	.049	.035	.024	.016	.011	.008	.135	.088	.055	.116	.077	.047	.080	.053	.033	.046	.031	.020	.015	.010	.007	.128	.080	.045	.110	.069	.039	.076	.048	.028	.044	.028	.017	.014	.009	.005	.121	.072	.038	.104	.063	.033	.072	.044	.024	.042	.026	.014	.014	.008	.005	.115	.066	.033	.099	.058	.029	.069	.040	.020	.040	.024	.012	.013	.008	.004	.108	.057	.029	.095	.053	.025	.066	.037	.018	.038	.022	.011	.012	.007	.003	.105	.057	.029	.093	.050	.022	.063	.035	.016	.037	.021	.009	.012	.007	.003																																																												
.139	.079	.025	.133	.076	.024	.123	.070	.022	.113	.065	.021	.104	.060	.019	.162	.162	.162	.138	.138	.138	.094	.094	.094	.054	.054	.054	.017	.017	.017	.144	.133	.124	.123	.115	.106	.084	.079	.074	.049	.046	.043	.016	.015	.014	.131	.112	.097	.112	.097	.084	.077	.067	.059	.044	.039	.034	.014	.013	.011	.120	.096	.078	.102	.083	.067	.070	.058	.047	.041	.034	.028	.013	.011	.009	.108	.084	.063	.095	.072	.055	.065	.050	.039	.038	.029	.023	.012	.010	.008	.098	.064	.045	.061	.044	.032	.035	.026	.019	.011	.009	.006	.011	.008	.006	.083	.057	.038	.057	.040	.027	.033	.023	.016	.011	.008	.005	.011	.008	.005	.074	.047	.028	.054	.036	.023	.031	.021	.014	.010	.007	.004	.010	.007	.004	.061	.049	.027	.051	.033	.020	.030	.019	.012	.010	.006	.004	.010	.006	.004	.049	.030	.017	.028	.018	.010	.009	.006	.003	.009	.006	.003	.009	.005	.003																																																																											
.092	.044	.012	.091	.044	.012	.088	.043	.012	.085	.042	.012	.082	.041	.012	.077	.077	.077	.067	.067	.067	.045	.045	.045	.027	.027	.027	.009	.009	.009																																																																																																																																																																																																																		

B.E.E. 4th Year; 1st Semester Examination 2018
Elective-I (Advanced Illumination Engineering)

Time: 3 hours

Use Separate Answer script for each part

Full Marks:100

Part-II

ANSWER ANY THREE QUESTIONS
QUESTION NO.1 CARRIES 18 MARKS

Q.1.

- (A) Explain Visual Acuity and Contrast Sensitivity related to the external factors of vision. Illustrate, with suitable diagram, the nature of their variation with background luminance.
- (B) Define luminance contrast and show that for the diffuse object and background it can be expressed in terms of their respective reflectance values.
- (C) Explain the concept of critical object size with the help of any one of the following visual test objects – (i) Landolt C ; (ii) parallel bar. (8+6+4=18)

Q.2.

- (A) Briefly discuss on working of the novel photoreceptors – the intrinsically photosensitive retinal ganglion cells on human circadian system.
- (B) What do you understand by Biological Action Spectra? How it differs from the photopic luminous efficacy function?
- (C) Show the variation of spectral transmittance of eye lens with age and hence comment on the statement- “The ageing eye sees a less-blue world”. (6+6+4=16)

Q.3.

- (A) Write down the major functions of a luminaire.
- (B) What is the use of Ingress Protection code for selection of outdoor luminaire?
- (C) What do you understand by (i) Relative photometry and (ii) Absolute photometry?
- (D) Briefly discuss on the photometric and electrical testing of LED luminaire according to Indian Standard 16106:2012. (2+2+2+10=16)

Q.4.

- (A) Define specific and general colour rendering index of a lamp. How these two are related?
- (B) The CCT model does not work for the saturated colour LEDs – explain.
- (C) How the colour of saturated colour LEDs are specified by Dominant wavelength and Purity? (6+4+6=16)

Q.5.

- A) Compute the tristimulus values and chromaticity coordinates of a line spectrum source using the following data:

λ (nm)	M_λ (W/cm ² .nm)	x_λ	y_λ	z_λ
490	1.83	0.0320	0.2080	0.4652
550	3.34	0.4334	0.9950	0.0087
680	8.10	0.0468	0.0170	0.0000

- B) Briefly discuss on the photometric specifications of (i) roadlight and (ii) floodlight luminaire. (6+10=16)