

MASTER IN ILLUMINATION ENGG.1ST YEAR 1ST SEM., EXAMINATION, 2024

LIGHTING DESIGN & CALCULATION

Time : Three hours

Full Marks : 100

Use separate Answer-script for each part

PART – I (60 Marks)

Question no.1 is Compulsory

1.a) In an office room of $4\text{m} \times 4\text{m} \times (2.3+0.8)\text{m}$ (shown in Fig.1) , the average $500\text{lux} \pm 15\%$ is to be provided by any type of symmetrically placed LED fitted recessed luminaires (four in number) of $600\text{mm} \times 600\text{mm}$ size. Considering reflectances of ceiling, wall and floor being 0.7 ,0.5, and 0.3 respectively, $\text{DLOR}=0.5$, $\text{MF}=0.7$, $\text{UF(c)}=0.15$, $\text{UF(w)} = 0.455$, $\text{UF(f)} = 0.65$, inter illuminance scalar factor of ceiling = 0.247, inter illuminance cylindrical factor=0.124, find out:

- i) The direct flux/klm for one luminaire (using inverse square law) at the centre of each small area (using given Table 1), the total working plane being divided in 16 small equal areas:
- ii) Find out the average scalar and cylindrical illuminances considering direct and reflected components. 12

b) What ratio indicates modeling properties of a general installation and what ratio helps to relate to the appearance of people's faces in a room – discuss , explaining the terms clearly for the above problem. 4

c) Write down the algorithm to find out Glare Index. If one observer is positioned at the middle of one 4m sided wall of room shown in Fig.1 , and the position index for the nearly placed luminaires is 12.85 and those for the other two far situated luminaires is 2.8, find out the Glare Index(GI), and comment whether it is satisfactory or not.[Consult the given necessary tables and data of the previous problem.]

Consider $\text{LLD} = 0.8$, $\text{LDD} = 0.75$ and $\text{RDD} = 0.85$.

8

[Turn over

Answer any two questions

2.a) A hall of 120 ft length and 30ft width has a triangular shaped ceiling roof, where all the top surfaces are made by steel framed glass having 15% reflectance. The two sides of the roof are 30ft and 18ft. The room is illuminated with Type 3 luminaire shown in Table 2 (fitted with LED bulb). If the distance of the lamp to working plane is 8 ft, distance between the floor and working plane is 2ft. 6inches, floor reflectance is 20%, wall reflectance is 50 %, reflectance of wall from floor to working plane is 30%,

- i) Find out the effective ceiling cavity reflectance.
- ii) Determine the value of RCR.
- iii) Find out the effective floor cavity reflectance.
- iv) Find out the CU value of the luminaire.
- v) Find out the number of luminaires to provide uniform 200 lux in the room.
- vi) Arrange the luminaires properly and show it.

Consider LLD = 0.8, LDD = 0.7 and RDD = 0.85.

Show the calculations of finding out all necessary cavity ratios and effective reflectances consulting given Tables .

10

b) Answer the followings with necessary diagrams/graphs/figures:

- i) Show the changes in dynamic V-I characteristics of fluorescent lamp, when frequency is varied from 50Hz to few kHz .Explain briefly. 3
- ii) Discuss on High pressure Sodium lamp Arc-tube material. 2
- iii) If, for a Uniform linear diffuser, $I(\alpha) = I(0) \cdot \cos^2 \alpha$, what will be the value of Parallel Plane Aspect Factor? 3

3.a) Calculate the scalar and cylindrical illuminance for a point source with an intensity of 7000 cd in the horizontal direction at a distance of 42 m. 4

b) On what factors do the CU value depend? 3

c) Draw an electronic ballast circuit (with high power factor facility) of a 4ft. fluorescent lamp and explain its operation briefly. 4

d) Explain the method of Illuminance calculation from a circular shaped diffused source and find out the illuminance from a circular source of 1.8 ft diameter, at a point vertically 5.6 ft. below. 3

e) Draw the circuit diagram and explain the operation of a LED driver, which uses Flyback Converter topology.

OR,

Explain the Parallel Plane Aspect Factor and mention its application in Illuminance calculation. 4

4.a) If a tube light is mounted direct above the front-edge of a work bench of 0.8 m width, both being 1.6 m long, the mounting height being 3.5 m, the transverse intensity being 800 cd at all angles, find the illuminance at the centre above the front edge. 4

b) Describe the difference in production of radiation in Low pressure and High Pressure Sodium Vapour lamp with necessary Spectral Power Distribution Diagrams. 4

c) A 60ft X 48ft X 14ft room has coffered ceiling, each cavity dimension being 3ft X 3ft X 1.5ft and separated by 1ft band. All ceiling surfaces have 80% reflectance, wall surfaces have 50% reflectance and floor surface has 20% reflectance. Determine the effective reflectance of the coffered ceiling. Use the given Tables, if necessary. 5

d) Determine the reflected component of initial Horizontal illuminance at a point 20 ft from the South wall and 12 ft from the East wall of the above room, if the LED luminaire with 50 W lamp (4800 lumen) had been fitted, in that room having flat ceiling. Assuming 20 luminaires to be fitted in the room and assuming total light loss factor as 0.85, calculate the reflected illuminance on Vertical surface also.

(Use the given necessary Tables). 5

Table 1

Angle (deg)	Mean intensity in vertical plane (cd/1000 lumens)
0	228
5	216
10	215
15	214
20	204
25	198
30	180
35	172
40	145
45	110
50	87
55	75
60	47
65	34
70	27
75	19
80	10
85	6
90	0

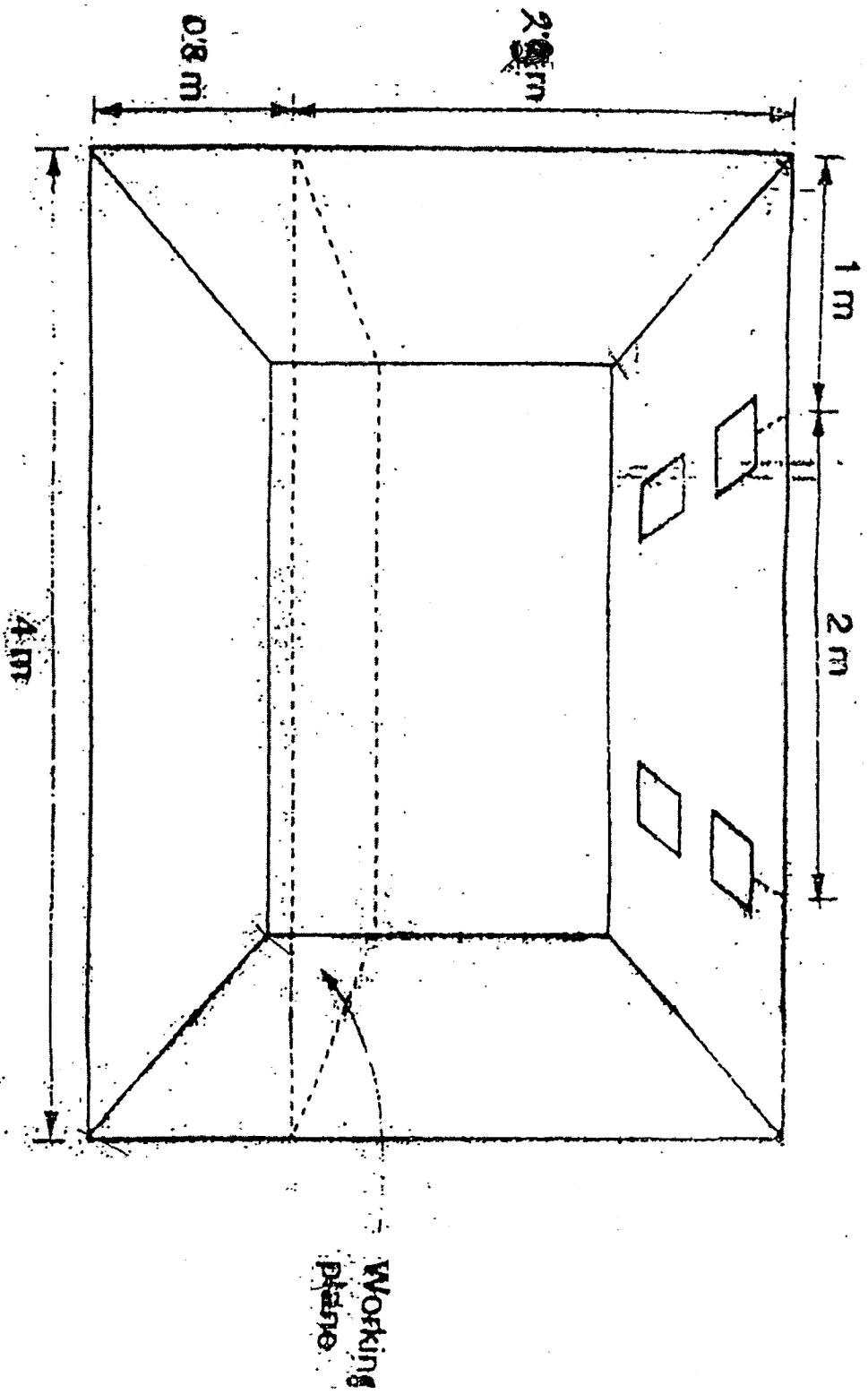


Fig. 1. The room with four luminaires

TABLE II
Coefficients of Utilization

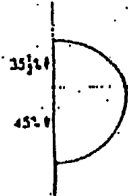
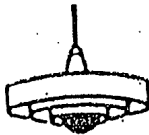
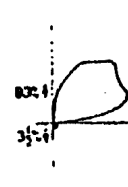
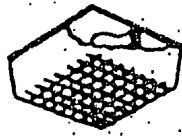
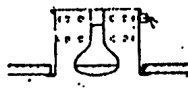
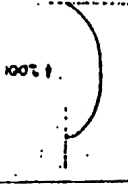
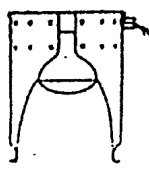
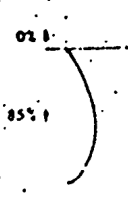
Typical Luminaire	Typical Intensity Distribution and Per Cent Lamp Lumens		P.C.C. →	90°			70°			50°			30°			10°			0°	W.D.R.C.	P.C.C. →
				50	30	10	50	30	10	50	30	10	50	30	10	50	30	10	0		
	Maint. Cal.	SC	RCR ↓	Coefficients of Utilization for 20 Per Cent Effective Floor Cavity Reflectance (ρ _{ec} = 20)																	RCR ↓
 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	.71	.66	.62	.65	.61	.58	.55	.52	.49	.46	.44	.42	.38	.36	.34	.30	.368	1
			2	.60	.53	.48	.55	.50	.45	.47	.42	.38	.39	.36	.32	.31	.29	.26	.23	.279	2
			3	.52	.44	.38	.48	.41	.38	.40	.35	.31	.33	.29	.26	.27	.24	.21	.18	.227	3
			4	.45	.37	.32	.42	.35	.29	.35	.30	.25	.29	.25	.21	.23	.20	.17	.14	.192	4
			5	.40	.32	.27	.37	.30	.25	.31	.25	.21	.26	.21	.18	.21	.17	.14	.12	.166	5
			6	.35	.28	.23	.33	.26	.21	.28	.22	.18	.23	.19	.15	.19	.15	.12	.10	.146	6
			7	.32	.25	.19	.29	.23	.18	.25	.20	.16	.21	.18	.13	.17	.13	.11	.09	.130	7
			8	.29	.22	.17	.27	.20	.16	.23	.17	.14	.19	.15	.12	.15	.12	.09	.07	.117	8
			9	.26	.19	.15	.24	.18	.14	.21	.16	.12	.17	.13	.10	.14	.11	.08	.07	.107	9
			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	.72	.69	.66	.62	.60	.57	.43	.42	.40	.28	.25	.25	.10	.10	.10	.03	.018	1
			2	.63	.58	.54	.54	.50	.47	.38	.35	.33	.23	.22	.20	.09	.09	.08	.02	.015	2
			3	.55	.49	.45	.47	.43	.39	.33	.30	.28	.20	.19	.17	.08	.07	.07	.02	.013	3
			4	.48	.42	.37	.42	.37	.33	.29	.26	.23	.18	.16	.15	.07	.06	.06	.02	.012	4
			5	.43	.36	.32	.37	.32	.28	.26	.23	.20	.16	.14	.12	.06	.06	.05	.01	.011	5
			6	.38	.32	.27	.33	.28	.24	.23	.20	.17	.14	.12	.11	.06	.05	.04	.01	.010	6
			7	.34	.28	.23	.30	.24	.21	.21	.17	.15	.13	.11	.09	.05	.04	.04	.01	.009	7
			8	.31	.25	.20	.27	.21	.18	.19	.15	.13	.12	.10	.08	.05	.04	.03	.01	.008	8
			9	.28	.22	.18	.24	.19	.16	.17	.14	.11	.10	.08	.07	.04	.03	.03	.01	.006	9
			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	.88	.88	.88	.85	.85	.85	.83		
			1	.87	.84	.81	.85	.82	.79	.82	.79	.77	.79	.76	.74	.76	.74	.72	.71	.323	1
			2	.78	.70	.65	.74	.69	.65	.71	.67	.63	.68	.65	.62	.64	.63	.60	.59	.311	2
			3	.68	.59	.54	.65	.59	.53	.62	.57	.53	.62	.56	.52	.58	.54	.51	.49	.288	3
			4	.58	.51	.45	.57	.50	.45	.55	.49	.44	.53	.46	.44	.51	.47	.43	.41	.264	4
			5	.52	.44	.39	.51	.44	.38	.49	.43	.38	.47	.42	.37	.46	.41	.37	.35	.241	5
			6	.46	.39	.33	.46	.38	.33	.44	.38	.33	.43	.37	.33	.41	.36	.32	.31	.221	6
			7	.42	.34	.29	.41	.34	.29	.40	.33	.29	.39	.33	.29	.38	.32	.28	.27	.203	7
			8	.38	.31	.26	.37	.31	.26	.36	.30	.26	.36	.30	.26	.34	.29	.25	.24	.187	8
			9	.34	.28	.23	.34	.28	.23	.33	.27	.23	.32	.27	.23	.32	.26	.23	.21	.173	9
			10	.32	.25	.21	.32	.25	.21	.31	.25	.21	.30	.24	.21	.29	.24	.20	.19	.161	10
 Prismatic square surface drum		1.3	0	.89	.89	.89	.85	.85	.85	.77	.77	.77	.70	.70	.70	.63	.63	.63	.60		
			1	.77	.74	.71	.74	.71	.68	.67	.65	.63	.61	.59	.57	.55	.54	.53	.50	.264	1
			2	.68	.63	.59	.65	.61	.57	.59	.56	.53	.54	.51	.49	.49	.47	.45	.42	.224	2
			3	.61	.55	.50	.58	.53	.48	.53	.49	.46	.49	.46	.42	.44	.42	.39	.37	.197	3
			4	.54	.48	.43	.52	.46	.42	.48	.43	.39	.44	.40	.37	.40	.37	.34	.32	.176	4
			5	.49	.42	.38	.47	.41	.37	.43	.38	.35	.40	.36	.33	.37	.33	.31	.29	.159	5
			6	.44	.38	.33	.43	.37	.32	.39	.34	.31	.36	.32	.29	.34	.30	.27	.26	.145	6
			7	.40	.34	.30	.39	.33	.29	.36	.31	.27	.33	.29	.26	.31	.27	.25	.23	.133	7
			8	.37	.31	.27	.36	.30	.26	.33	.28	.25	.31	.27	.24	.29	.25	.22	.21	.124	8
			9	.34	.28	.24	.33	.27	.24	.31	.26	.22	.29	.24	.21	.27	.23	.20	.19	.115	9
			10	.32	.26	.22	.30	.25	.21	.28	.24	.21	.27	.23	.20	.25	.21	.19	.17	.108	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	1.08	1.05	1.03	1.08	1.03	1.01	1.02	1.00	.98	.98	.97	.95	.95	.93	.92	.90	.241	1
			2	.99	.94	.89	.97	.92	.88	.93	.90	.86	.90	.87	.84	.88	.85	.83	.81	.238	2
			3	.90	.84	.79	.88	.83	.78	.86	.81	.77	.83	.79	.76	.81	.77	.74	.73	.227	3
			4	.82	.75	.70	.81	.75	.70	.79	.73	.69	.77	.72	.68	.75	.71	.67	.66	.215	4
			5	.78	.68	.63	.75	.68	.63	.73	.67	.62	.71	.66	.62	.69	.65	.61	.59	.202	5
			6	.70	.62	.57	.69	.62	.57	.67	.61	.57	.66	.60	.56	.64	.60	.56	.54	.191	6
			7	.65	.57	.52	.64	.57	.52	.62	.56	.52	.61	.56	.52	.60	.55	.51	.50	.180	7
			8	.60	.53	.48	.59	.53	.48	.58	.52	.48	.57	.52	.47	.56	.51	.47	.46	.169	8
			9	.56	.49	.44	.55	.49	.44	.54	.48	.44	.53	.48	.44	.52	.47	.44	.42	.160	9
			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, skirt, 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	.85	.83	.81	.83	.81	.80	.89	.86	.87	.86	.85	.84	.83	.82	.82	.80	.115	1
			2	.80	.78	.76	.82	.79	.76	.80	.77	.75	.80	.78	.76	.80	.78	.77	.76	.115	2
			3	.83	.80	.77	.82	.79	.76	.80	.77	.75	.78	.76	.74	.78	.74	.72	.71	.113	3
			4	.79	.74	.71	.78	.74	.71	.76	.73	.70	.74	.71	.69	.73	.70	.68	.67	.110	4
			5	.74	.70	.67	.74	.69	.66	.72	.68	.66	.71	.68	.65	.69	.67	.65	.63	.107	5
			6	.70	.66	.62	.70	.65	.62	.68	.65	.62	.67	.64	.61	.66	.63	.61	.60	.104	6
			7	.67	.62	.59	.66	.62	.59	.65	.61	.58	.64	.61	.58	.63	.60	.58	.57	.100	7
			8	.63	.59	.56	.63	.58	.55	.62	.58	.55	.61	.58	.55	.60	.57	.55	.54	.097	8
			9	.60	.56	.53	.60	.56	.53	.59	.55	.52	.58	.55	.52	.58	.54	.52	.51	.094	9
			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 ($\rho_{fc} = 20$)																											Ceiling Cavity Exitance Coefficients for 20 Per Cent Floor Cavity Reflectance ($\rho_{fc} = 20$)																																			
.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	.275	.150	.046	.259	.143	.044	.231	.129	.040	.205	.115	.036	.181	.102	.032	.417	.379	.347	.357	.327	.300	.245	.226	.209	.141	.131	.123	.045	.043	.040			
.240	.128	.038	.226	.121	.036	.200	.108	.033	.176	.097	.030	.154	.085	.026	.412	.367	.332	.353	.317	.287	.242	.220	.202	.140	.128	.119	.045	.042	.039	.214	.111	.033	.201	.105	.031	.177	.094	.028	.155	.083	.025	.135	.073	.022	.406	.358	.321	.348	.309	.279	.239	.215	.196	.138	.126	.116	.045	.041	.038			
.193	.098	.028	.181	.093	.027	.160	.083	.024	.139	.073	.022	.120	.064	.019	.400	.350	.314	.343	.303	.273	.236	.212	.193	.137	.124	.114	.044	.041	.038	.176	.088	.025	.165	.084	.024	.145	.074	.022	.126	.066	.019	.109	.057	.017	.394	.344	.309	.338	.298	.269	.234	.209	.190	.135	.123	.113	.044	.040	.037			
.162	.080	.023	.152	.076	.022	.133	.067	.019	.116	.059	.017	.100	.052	.015	.388	.339	.305	.334	.294	.266	.231	.206	.188	.134	.122	.112	.043	.040	.037	.150	.073	.021	.140	.069	.020	.123	.062	.018	.107	.054	.016	.092	.047	.014	.383	.335	.302	.330	.291	.264	.228	.204	.187	.133	.120	.111	.043	.039	.037			
.139	.067	.019	.131	.064	.018	.115	.057	.016	.099	.050	.014	.085	.043	.013	.378	.332	.300	.326	.288	.262	.226	.202	.186	.131	.119	.111	.043	.039	.037	.130	.062	.017	.122	.059	.016	.107	.052	.015	.093	.046	.013	.080	.040	.011	.374	.328	.298	.322	.285	.260	.223	.201	.185	.130	.119	.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	.207	.114	.035	.179	.099	.030	.126	.070	.022	.077	.043	.013	.031	.018	.006	.784	.755	.731	.671	.650	.632	.463	.450	.441	.265	.262	.258	.085	.085	.084			
.191	.102	.030	.165	.088	.027	.116	.063	.019	.071	.039	.012	.029	.016	.005	.778	.743	.715	.667	.641	.620	.458	.445	.435	.265	.260	.256	.085	.084	.084	.177	.092	.027	.153	.080	.024	.106	.057	.017	.066	.035	.011	.027	.014	.004	.773	.734	.703	.664	.634	.611	.456	.442	.430	.264	.259	.255	.085	.084	.084			
.164	.084	.024	.142	.073	.021	.100	.052	.015	.061	.032	.010	.025	.013	.004	.768	.726	.696	.660	.629	.605	.455	.439	.427	.263	.258	.253	.085	.084	.084	.153	.077	.022	.133	.067	.019	.094	.048	.014	.057	.030	.009	.023	.012	.004	.764	.721	.690	.656	.624	.601	.453	.437	.425	.263	.257	.253	.085	.084	.083			
.143	.071	.020	.124	.062	.018	.088	.044	.013	.054	.027	.008	.022	.011	.003	.759	.716	.686	.653	.621	.598	.451	.435	.423	.262	.256	.252	.085	.084	.083	.134	.066	.018	.116	.057	.016	.082	.041	.012	.050	.026	.007	.020	.010	.003	.755	.712	.683	.650	.618	.595	.450	.434	.422	.262	.256	.252	.085	.084	.083			
.126	.061	.017	.109	.053	.015	.077	.038	.011	.047	.024	.007	.019	.010	.003	.751	.709	.680	.647	.615	.593	.448	.432	.421	.261	.255	.251	.085	.084	.083	.119	.057	.016	.103	.050	.014	.073	.036	.010	.045	.022	.006	.018	.009	.003	.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	.128	.041	.212	.123	.040	.159	.159	.159	.136	.136	.136	.093	.093	.093	.053	.053	.053	.017	.017	.017	.240	.131	.040	.235	.129	.040	.225	.125	.039	.216	.121	.038	.208	.117	.037	.143	.110	.082	.123	.095	.071	.064	.066	.050	.048	.038	.029	.016	.012	.009			
.225	.120	.036	.220	.118	.036	.212	.115	.035	.204	.112	.034	.196	.109	.034	.137	.095	.062	.118	.082	.054	.061	.057	.036	.047	.033	.022	.015	.011	.007	.209	.109	.032	.205	.107	.032	.197	.105	.031	.190	.102	.031	.184	.100	.030	.131	.084	.048	.113	.073	.042	.077	.051	.030	.045	.030	.018	.014	.010	.006			
.194	.099	.029	.191	.098	.029	.184	.096	.028	.177	.094	.028	.171	.092	.026	.125	.076	.039	.108	.065	.034	.074	.046	.024	.043	.027	.014	.014	.009	.005	.181	.091	.026	.177	.090	.026	.171	.088	.026	.166	.086	.025	.160	.084	.025	.114	.063	.027	.098	.055	.024	.068	.038	.017	.039	.023	.010	.013	.007	.003			
.168	.083	.024	.165	.082	.023	.160	.081	.023	.155	.079	.023	.150	.078	.023	.114	.063	.027	.098	.055	.024	.068	.038	.017	.039	.023	.010	.013	.007	.003	.157	.077	.022	.155	.076	.022	.150	.075	.021	.145	.074	.021	.141	.072	.021	.109	.058	.024	.093	.050	.021	.065	.035	.015	.038	.021	.009	.012	.007	.003			
.147	.071	.020	.145	.071	.020	.141	.070	.020	.136	.068	.020	.133	.067	.019	.103	.054	.021	.089	.047	.018	.062	.033	.013	.038	.019	.008	.012	.006	.003	.147	.071	.020	.145	.071	.020	.141	.070	.020	.136	.068	.020	.133	.067	.019	.103	.054	.021	.089	.047	.018	.062	.033	.013	.038	.019	.008	.012	.006	.003			
.138	.066	.018	.136	.066	.018	.132	.065	.018	.129	.064	.018	.125	.063	.018	.099	.051	.018	.085	.044	.016	.059	.031	.011	.034	.018	.007	.011	.006	.002	.138	.066	.018	.136	.066	.018	.132	.065	.018	.129	.064	.018	.125	.063	.018	.099	.051	.018	.085	.044	.016	.059	.031	.011	.034	.018	.007	.011	.006	.002			
.243	.138	.044	.232	.132	.042	.211	.121	.039	.192	.111	.038	.175	.101	.033	.283	.264	.247	.242	.227	.213	.166	.156	.147	.095	.090	.085	.031	.029	.028	.216	.118	.036	.206	.114	.035	.187	.104	.032	.167	.104	.030	.154	.087	.027	.126	.070	.021	.263	.223	.192	.226	.192	.167	.155	.134	.117	.090	.079	.069	.029	.026	.023
.196	.104	.031	.187	.100	.030	.170	.092	.028	.164	.085	.028	.140	.077	.024	.269	.233	.204	.231	.201	.177	.158	.139	.124	.092	.081	.073	.029	.026	.024	.180	.093	.027	.171	.090	.027	.156	.083	.025	.142	.076	.023	.128	.070	.021	.257	.215	.183	.221	.186	.160	.152	.130	.113	.088	.076	.067	.028	.025	.022			
.166	.084	.024	.158	.081	.024	.144	.075	.022	.131	.069	.021	.119	.064	.019	.263	.223	.192	.231	.201	.177	.158	.139	.124	.092	.081	.073	.029	.026	.024	.154	.077	.022	.147	.074	.021	.134	.069	.020	.122	.064	.019	.111	.058	.017	.252	.208	.177	.216	.180	.154	.149	.126	.109	.087	.074	.065	.028	.024	.021			
.143	.071	.020	.137	.068	.019	.125	.063	.018	.114	.059	.017	.104	.054	.016	.246	.203	.173	.212	.176	.151	.146	.123	.107	.085	.073	.063	.027	.024	.021	.134	.066	.018	.129	.063	.018	.118	.058	.017	.108	.055	.016	.098	.050	.015	.242	.199	.169	.208	.172	.148	.144	.121	.105	.084	.071	.062	.027	.023	.021			
.126	.061	.017	.121	.059	.017	.111	.055	.016	.102	.051	.015	.093	.047	.014	.237	.195	.166	.204	.169	.145	.142	.119	.103	.083	.070	.061	.027	.023	.020	.119	.057	.016	.114	.055	.015	.105	.051	.014	.096	.048	.014	.088	.044	.013	.233	.192	.164	.201	.167	.143	.139	.117	.102	.081	.069	.061	.026	.022	.020			
.220	.125	.040	.213	.122	.039	.200	.115	.037	.189	.109	.035	.178	.103	.033	.190	.180	.180	.163	.163	.163	.111	.111	.111	.064	.064	.064	.020	.020	.020	.212	.116	.036	.206	.114	.035	.195	.109	.034	.185	.104	.033	.176	.099	.031	.161	.132	.107	.138	.114	.093	.095	.079	.065	.055	.046	.038	.018	.015	.012			
.202	.107	.032	.187	.105	.032	.167	.101	.031	.178	.098	.030	.170	.094	.029	.151	.114	.084	.130	.098	.073	.069	.068	.051	.055	.040	.030	.017	.013																																		

Table III

Multiplying Factors for Other than 20 Per Cent Effective Floor Cavity Reflectance

% Effective Ceiling Cavity Reflectance, ρ_{ce}	80					70					50					30					10				
% Wall Reflectance, ρ_{wa}	70	50	30	10	70	50	30	10	70	50	30	10	70	50	30	10	70	50	30	10	70	50	30	10	
For 20 Per Cent Effective Floor Cavity Reflectance (20 Per Cent = 1.007)																									
Room Cavity Ratio																									
1	1.002	1.002	1.002	1.002	1.007	1.007	1.004	1.004	1.009	1.009	1.004	1.004	1.009	1.009	1.004	1.004	1.009	1.009	1.004	1.004	1.009	1.009	1.004	1.004	
2	1.007	1.004	1.004	1.004	1.008	1.007	1.004	1.004	1.009	1.009	1.004	1.004	1.009	1.009	1.004	1.004	1.009	1.009	1.004	1.004	1.009	1.009	1.004	1.004	
3	1.007	1.004	1.004	1.003	1.008	1.007	1.004	1.004	1.009	1.009	1.004	1.004	1.009	1.009	1.004	1.004	1.009	1.009	1.004	1.004	1.009	1.009	1.004	1.004	
4	1.002	1.004	1.003	1.004	1.005	1.004	1.003	1.004	1.009	1.009	1.004	1.004	1.009	1.009	1.004	1.004	1.009	1.009	1.004	1.004	1.009	1.009	1.004	1.004	
5	1.004	1.003	1.003	1.004	1.005	1.004	1.004	1.004	1.009	1.009	1.004	1.004	1.009	1.009	1.004	1.004	1.009	1.009	1.004	1.004	1.009	1.009	1.004	1.004	
6	1.002	1.003	1.003	1.004	1.005	1.004	1.004	1.004	1.009	1.009	1.004	1.004	1.009	1.009	1.004	1.004	1.009	1.009	1.004	1.004	1.009	1.009	1.004	1.004	
7	1.007	1.003	1.003	1.004	1.005	1.004	1.004	1.004	1.009	1.009	1.004	1.004	1.009	1.009	1.004	1.004	1.009	1.009	1.004	1.004	1.009	1.009	1.004	1.004	
8	1.004	1.003	1.003	1.004	1.005	1.004	1.004	1.004	1.009	1.009	1.004	1.004	1.009	1.009	1.004	1.004	1.009	1.009	1.004	1.004	1.009	1.009	1.004	1.004	
9	1.004	1.003	1.003	1.004	1.005	1.004	1.004	1.004	1.009	1.009	1.004	1.004	1.009	1.009	1.004	1.004	1.009	1.009	1.004	1.004	1.009	1.009	1.004	1.004	
10	1.007	1.002	1.004	1.007	1.008	1.007	1.002	1.007	1.009	1.009	1.004	1.004	1.009	1.009	1.004	1.004	1.009	1.009	1.004	1.004	1.009	1.009	1.004	1.004	
For 10 Per Cent Effective Floor Cavity Reflectance (20 Per Cent = 1.007)																									
Room Cavity Ratio																									
1	0.979	0.979	0.979	0.979	0.979	0.979	0.979	0.979	0.979	0.979	0.979	0.979	0.979	0.979	0.979	0.979	0.979	0.979	0.979	0.979	0.979	0.979	0.979	0.979	
2	0.971	0.972	0.970	0.970	0.970	0.970	0.970	0.970	0.970	0.970	0.970	0.970	0.970	0.970	0.970	0.970	0.970	0.970	0.970	0.970	0.970	0.970	0.970	0.970	
3	0.969	0.971	0.971	0.969	0.970	0.970	0.969	0.970	0.970	0.970	0.970	0.970	0.970	0.970	0.970	0.970	0.970	0.970	0.970	0.970	0.970	0.970	0.970	0.970	
4	0.944	0.958	0.958	0.978	0.970	0.963	0.973	0.970	0.970	0.970	0.970	0.970	0.970	0.970	0.970	0.970	0.970	0.970	0.970	0.970	0.970	0.970	0.970	0.970	
5	0.949	0.968	0.968	0.978	0.963	0.964	0.968	0.978	0.965	0.975	0.965	0.975	0.965	0.975	0.965	0.975	0.965	0.975	0.965	0.975	0.965	0.975	0.965	0.975	
6	0.953	0.968	0.970	0.968	0.968	0.972	0.962	0.968	0.968	0.977	0.968	0.962	0.968	0.968	0.977	0.968	0.962	0.968	0.968	0.977	0.968	0.962	0.968	0.968	
7	0.957	0.973	0.963	0.991	0.961	0.975	0.965	0.991	0.975	0.967	0.994	0.963	0.994	0.963	0.994	0.963	0.994	0.963	0.994	0.963	0.994	0.963	0.994	0.963	
8	0.960	0.978	0.967	0.983	0.963	0.977	0.967	0.983	0.963	0.981	0.968	0.964	0.981	0.968	0.964	0.981	0.968	0.964	0.981	0.968	0.964	0.981	0.968	0.964	
9	0.963	0.978	0.967	0.984	0.963	0.978	0.969	0.984	0.963	0.980	0.968	0.965	0.980	0.968	0.965	0.980	0.968	0.965	0.980	0.968	0.965	0.980	0.968	0.965	
10	0.968	0.980	0.969	0.995	0.967	0.981	0.980	0.995	0.964	0.981	0.987	0.964	0.981	0.987	0.964	0.981	0.987	0.964	0.981	0.987	0.964	0.981	0.987	0.964	
For 0 Per Cent Effective Floor Cavity Reflectance (20 Per Cent = 1.007)																									
Room Cavity Ratio																									
1	0.959	0.970	0.979	0.965	0.973	0.984	0.953	0.973	0.973	0.973	0.973	0.973	0.973	0.973	0.973	0.973	0.973	0.973	0.973	0.973	0.973	0.973	0.973	0.973	
2	0.977	0.977	0.973	0.975	0.986	0.972	0.976	0.976	0.976	0.976	0.976	0.976	0.976	0.976	0.976	0.976	0.976	0.976	0.976	0.976	0.976	0.976	0.976	0.976	
3	0.982	0.974	0.975	0.975	0.986	0.974	0.974	0.974	0.974	0.974	0.974	0.974	0.974	0.974	0.974	0.974	0.974	0.974	0.974	0.974	0.974	0.974	0.974	0.974	
4	0.983	0.979	0.971	0.983	0.988	0.978	0.978	0.978	0.978	0.978	0.978	0.978	0.978	0.978	0.978	0.978	0.978	0.978	0.978	0.978	0.978	0.978	0.978	0.978	
5	0.983	0.980	0.979	0.983	0.988	0.978	0.978	0.978	0.978	0.978	0.978	0.978	0.978	0.978	0.978	0.978	0.978	0.978	0.978	0.978	0.978	0.978	0.978	0.978	
6	0.971	0.981	0.973	0.979	0.987	0.975	0.975	0.975	0.975	0.975	0.975	0.975	0.975	0.975	0.975	0.975	0.975	0.975	0.975	0.975	0.975	0.975	0.975	0.975	
7	0.971	0.977	0.967	0.977	0.985	0.973	0.973	0.973	0.973	0.973	0.973	0.973	0.973	0.973	0.973	0.973	0.973	0.973	0.973	0.973	0.973	0.973	0.973	0.973	
8	0.972	0.983	0.971	0.983	0.988	0.977	0.977	0.977	0.977	0.977	0.977	0.977	0.977	0.977	0.977	0.977	0.977	0.977	0.977	0.977	0.977	0.977	0.977	0.977	
9	0.978	0.983	0.975	0.983	0.988	0.978	0.978	0.978	0.978	0.978	0.978	0.978	0.978	0.978	0.978	0.978	0.978	0.978	0.978	0.978	0.978	0.978	0.978	0.978	
10	0.983	0.982	0.979	0.987	0.993	0.981	0.981	0.981	0.981	0.981	0.981	0.981	0.981	0.981	0.981	0.981	0.981	0.981	0.981	0.981	0.981	0.981	0.981	0.981	

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

Per Cent Basal Reflectance	60																				70																				80																				50																			
	50	60	70	80	90	50	60	70	80	90	50	60	70	80	90	50	60	70	80	90	50	60	70	80	90	50	60	70	80	90	50	60	70	80	90																																													
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																																									
0.2	89	88	87	86	85	84	83	82	81	80	79	78	77	76	75	74	73	72	71	70	69	68	67	66	65	64	63	62	61	60	59	58	57	56	55	54	53	52	51	50																																								
0.4	88	87	86	85	84	83	82	81	80	79	78	77	76	75	74	73	72	71	70	69	68	67	66	65	64	63	62	61	60	59	58	57	56	55	54	53	52	51	50																																									
0.6	87	86	85	84	83	82	81	80	79	78	77	76	75	74	73	72	71	70	69	68	67	66	65	64	63	62	61	60	59	58	57	56	55	54	53	52	51	50																																										
0.8	86	85	84	83	82	81	80	79	78	77	76	75	74	73	72	71	70	69	68	67	66	65	64	63	62	61	60	59	58	57	56	55	54	53	52	51	50																																											
1.0	85	84	83	82	81	80	79	78	77	76	75	74	73	72	71	70	69	68	67	66	65	64	63	62	61	60	59	58	57	56	55	54	53	52	51	50																																												
1.2	84	83	82	81	80	79	78	77	76	75	74	73	72	71	70	69	68	67	66	65	64	63	62	61	60	59	58	57	56	55	54	53	52	51	50																																													
1.4	83	82	81	80	79	78	77	76	75	74	73	72	71	70	69	68	67	66	65	64	63	62	61	60	59	58	57	56	55	54	53	52	51	50																																														
1.6	82	81	80	79	78	77	76	75	74	73	72	71	70	69	68	67	66	65	64	63	62	61	60	59	58	57	56	55	54	53	52	51	50																																															
1.8	81	80	79	78	77	76	75	74	73	72	71	70	69	68	67	66	65	64	63	62	61	60	59	58	57	56	55	54	53	52	51	50																																																
2.0	80	79	78	77	76	75	74	73	72	71	70	69	68	67	66	65	64	63	62	61	60	59	58	57	56	55	54	53	52	51	50																																																	
2.2	79	78	77	76	75	74	73	72	71	70	69	68	67	66	65	64	63	62	61	60	59	58	57	56	55	54	53	52	51	50																																																		
2.4	78	77	76	75	74	73	72	71	70	69	68	67	66	65	64	63	62	61	60	59	58	57	56	55	54	53	52	51	50																																																			
2.6	77	76	75	74	73	72	71	70	69	68	67	66	65	64	63	62	61	60	59	58	57	56	55	54	53	52	51	50																																																				
2.8	76	75	74	73	72	71	70	69	68	67	66	65	64	63	62	61	60	59	58	57	56	55	54	53	52	51	50																																																					
3.0	75	74	73	72	71	70	69	68	67	66	65	64	63	62	61	60	59	58	57	56	55	54	53	52	51	50																																																						
3.2	74	73	72	71	70	69	68	67	66	65	64	63	62	61	60	59	58	57	56	55	54	53	52	51	50																																																							
3.4	73	72	71	70	69	68	67	66	65	64	63	62	61	60	59	58	57	56	55	54	53	52	51	50																																																								
3.6	72	71	70	69	68	67	66	65	64	63	62	61	60	59	58	57	56	55	54	53	52	51	50																																																									
3.8	71	70	69	68	67	66	65	64	63	62	61	60	59	58	57	56	55	54	53	52	51	50																																																										
4.0	70	69	68	67	66	65	64	63	62	61	60	59	58	57	56	55	54	53	52	51	50																																																											
4.2	69	68	67	66	65	64	63	62	61	60	59	58	57	56	55	54	53	52	51	50																																																												
4.4	68	67	66	65	64	63	62	61	60	59	58	57	56	55	54	53	52	51	50																																																													
4.6	67	66	65	64	63	62	61	60	59	58	57	56	55	54	53	52	51	50																																																														
4.8	66	65	64	63	62	61	60	59	58	57	56	55	54	53	52	51	50																																																															
5.0	65	64	63	62	61	60	59	58	57	56	55	54	53	52	51	50																																																																
5.2	64	63	62	61	60	59	58	57	56	55	54	53	52	51	50																																																																	
5.4	63	62	61	60	59	58	57	56	55	54	53	52	51	50																																																																		
5.6	62	61	60	59	58	57	56	55	54	53	52	51	50																																																																			
5.8	61	60	59	58	57	56	55	54	53	52	51	50																																																																				
6.0	60	59	58	57	56	55	54	53	52	51	50																																																																					
6.2	59	58	57	56	55	54	53	52	51	50																																																																						
6.4	58	57	56	55	54	53	52	51	50																																																																							
6.6	57	56	55	54	53	52	51	50																																																																								
6.8	56	55	54	53	52	51	50																																																																									
7.0	55	54	53	52	51	50																																																																										
7.2	54	53	52	51	50																																																																											
7.4	53	52	51	50																																																																												
7.6	52	51	50																																																																													
7.8	51	50																																																																														
8.0	50																																																																															

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

Table IV - Continued *

Per Cent Beam Reflections	40	30	20	10	0
Per Cent Wall Reflections	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	90 80 70 60 50 40 30 20 10 0
Cavity Ratio	0.2 0.4 0.6 0.8 1.0	0.2 0.4 0.6 0.8 1.0	0.2 0.4 0.6 0.8 1.0	0.2 0.4 0.6 0.8 1.0	0.2 0.4 0.6 0.8 1.0
1.2	42 39 36 33 31 27 23 20 17 15 13	42 39 36 33 31 27 23 20 17 15 13	42 39 36 33 31 27 23 20 17 15 13	42 39 36 33 31 27 23 20 17 15 13	42 39 36 33 31 27 23 20 17 15 13
1.4	42 39 37 35 32 28 24 21 18 16 14	42 39 37 35 32 28 24 21 18 16 14	42 39 37 35 32 28 24 21 18 16 14	42 39 37 35 32 28 24 21 18 16 14	42 39 37 35 32 28 24 21 18 16 14
1.6	42 39 37 35 32 28 24 21 18 16 14	42 39 37 35 32 28 24 21 18 16 14	42 39 37 35 32 28 24 21 18 16 14	42 39 37 35 32 28 24 21 18 16 14	42 39 37 35 32 28 24 21 18 16 14
1.8	42 39 36 34 31 26 22 19 16 14 12	42 39 36 34 31 26 22 19 16 14 12	42 39 36 34 31 26 22 19 16 14 12	42 39 36 34 31 26 22 19 16 14 12	42 39 36 34 31 26 22 19 16 14 12
2.0	42 39 36 34 31 26 22 19 16 14 12	42 39 36 34 31 26 22 19 16 14 12	42 39 36 34 31 26 22 19 16 14 12	42 39 36 34 31 26 22 19 16 14 12	42 39 36 34 31 26 22 19 16 14 12
2.2	42 39 36 33 30 27 24 21 18 16 14	42 39 36 33 30 27 24 21 18 16 14	42 39 36 33 30 27 24 21 18 16 14	42 39 36 33 30 27 24 21 18 16 14	42 39 36 33 30 27 24 21 18 16 14
2.4	42 39 35 33 28 25 22 19 16 14 12	42 39 35 33 28 25 22 19 16 14 12	42 39 35 33 28 25 22 19 16 14 12	42 39 35 33 28 25 22 19 16 14 12	42 39 35 33 28 25 22 19 16 14 12
2.6	42 39 35 32 26 23 20 17 15 13 11	42 39 35 32 26 23 20 17 15 13 11	42 39 35 32 26 23 20 17 15 13 11	42 39 35 32 26 23 20 17 15 13 11	42 39 35 32 26 23 20 17 15 13 11
2.8	42 39 35 32 26 23 20 17 15 13 11	42 39 35 32 26 23 20 17 15 13 11	42 39 35 32 26 23 20 17 15 13 11	42 39 35 32 26 23 20 17 15 13 11	42 39 35 32 26 23 20 17 15 13 11
3.0	42 39 35 31 27 24 21 18 16 14 12	42 39 35 31 27 24 21 18 16 14 12	42 39 35 31 27 24 21 18 16 14 12	42 39 35 31 27 24 21 18 16 14 12	42 39 35 31 27 24 21 18 16 14 12
3.2	43 39 35 31 27 23 20 17 15 13 11	43 39 35 31 27 23 20 17 15 13 11	43 39 35 31 27 23 20 17 15 13 11	43 39 35 31 27 23 20 17 15 13 11	43 39 35 31 27 23 20 17 15 13 11
3.4	43 39 34 30 26 23 20 17 14 12 11	43 39 34 30 26 23 20 17 14 12 11	43 39 34 30 26 23 20 17 14 12 11	43 39 34 30 26 23 20 17 14 12 11	43 39 34 30 26 23 20 17 14 12 11
3.6	44 39 34 30 26 22 19 16 14 11 10	44 39 34 30 26 22 19 16 14 11 10	44 39 34 30 26 22 19 16 14 11 10	44 39 34 30 26 22 19 16 14 11 10	44 39 34 30 26 22 19 16 14 11 10
3.8	44 38 33 29 25 22 18 15 13 10 09	44 38 33 29 25 22 18 15 13 10 09	44 38 33 29 25 22 18 15 13 10 09	44 38 33 29 25 22 18 15 13 10 09	44 38 33 29 25 22 18 15 13 10 09
4.0	44 38 33 29 25 21 18 15 12 10 08	44 38 33 29 25 21 18 15 12 10 08	44 38 33 29 25 21 18 15 12 10 08	44 38 33 29 25 21 18 15 12 10 08	44 38 33 29 25 21 18 15 12 10 08
4.2	44 38 33 29 24 21 17 15 12 10 08	44 38 33 29 24 21 17 15 12 10 08	44 38 33 29 24 21 17 15 12 10 08	44 38 33 29 24 21 17 15 12 10 08	44 38 33 29 24 21 17 15 12 10 08
4.4	44 38 33 28 24 20 17 14 11 09 06	44 38 33 28 24 20 17 14 11 09 06	44 38 33 28 24 20 17 14 11 09 06	44 38 33 28 24 20 17 14 11 09 06	44 38 33 28 24 20 17 14 11 09 06
4.6	44 38 32 28 23 19 16 14 11 08 06	44 38 32 28 23 19 16 14 11 08 06	44 38 32 28 23 19 16 14 11 08 06	44 38 32 28 23 19 16 14 11 08 06	44 38 32 28 23 19 16 14 11 08 06
4.8	44 38 32 27 22 19 16 13 10 08 05	44 38 32 27 22 19 16 13 10 08 05	44 38 32 27 22 19 16 13 10 08 05	44 38 32 27 22 19 16 13 10 08 05	44 38 32 27 22 19 16 13 10 08 05
5.0	45 38 31 27 22 19 15 13 10 07 07	45 38 31 27 22 19 15 13 10 07 07	45 38 31 27 22 19 15 13 10 07 07	45 38 31 27 22 19 15 13 10 07 07	45 38 31 27 22 19 15 13 10 07 07
6.0	44 37 30 26 20 17 13 11 08 06 04	44 37 30 26 20 17 13 11 08 06 04	44 37 30 26 20 17 13 11 08 06 04	44 37 30 26 20 17 13 11 08 06 04	44 37 30 26 20 17 13 11 08 06 04
7.0	44 36 29 24 19 16 12 10 07 04 03	44 36 29 24 19 16 12 10 07 04 03	44 36 29 24 19 16 12 10 07 04 03	44 36 29 24 19 16 12 10 07 04 03	44 36 29 24 19 16 12 10 07 04 03
8.0	44 35 28 23 18 15 11 09 06 03 02	44 35 28 23 18 15 11 09 06 03 02	44 35 28 23 18 15 11 09 06 03 02	44 35 28 23 18 15 11 09 06 03 02	44 35 28 23 18 15 11 09 06 03 02
9.0	44 35 28 21 16 13 10 06 05 02 01	44 35 28 21 16 13 10 06 05 02 01	44 35 28 21 16 13 10 06 05 02 01	44 35 28 21 16 13 10 06 05 02 01	44 35 28 21 16 13 10 06 05 02 01
10.0	43 34 25 20 15 12 08 07 05 02 01	43 34 25 20 15 12 08 07 05 02 01	43 34 25 20 15 12 08 07 05 02 01	43 34 25 20 15 12 08 07 05 02 01	43 34 25 20 15 12 08 07 05 02 01

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

Table V

Room Position Multipliers

(For All Room Cavity Ratios and All Points Designated by a Number and a Letter as Shown in Fig. 9-31.)

	RCR	Points Along Length of Room					
		A	B	C	D	E	F
0	1	.24	.42	.47	.48	.48	.48
	2	.24	.36	.42	.44	.46	.46
	3	.23	.32	.37	.40	.42	.42
	4	.22	.28	.32	.35	.37	.37
	5	.21	.25	.28	.31	.33	.33
	6	.20	.23	.26	.28	.29	.30
	7	.18	.21	.23	.25	.26	.27
	8	.17	.18	.21	.22	.22	.23
	9	.15	.17	.18	.19	.20	.20
	10	.14	.16	.16	.17	.18	.18
1	1	.42	.74	.81	.83	.84	.84
	2	.36	.51	.60	.63	.66	.68
	3	.32	.40	.48	.51	.53	.57
	4	.28	.33	.40	.42	.44	.48
	5	.25	.29	.33	.36	.38	.42
	6	.23	.26	.29	.31	.33	.36
	7	.21	.23	.26	.28	.29	.30
	8	.18	.20	.23	.25	.26	.26
	9	.17	.18	.20	.21	.22	.23
	10	.16	.17	.18	.19	.19	.20
2	1	.47	.81	.90	.92	.93	.93
	2	.42	.60	.68	.72	.78	.83
	3	.37	.48	.58	.61	.64	.67
	4	.32	.40	.48	.50	.52	.57
	5	.28	.33	.40	.42	.44	.48
	6	.26	.29	.35	.37	.38	.40
	7	.23	.26	.30	.32	.33	.34
	8	.21	.23	.26	.27	.28	.29
	9	.18	.20	.23	.24	.25	.25
	10	.16	.18	.19	.21	.22	.22
3	1	.48	.83	.92	.94	.95	.95
	2	.44	.63	.72	.77	.82	.85
	3	.40	.51	.61	.65	.69	.71
	4	.35	.42	.50	.54	.58	.61
	5	.31	.36	.42	.46	.49	.52
	6	.28	.31	.37	.39	.41	.43
	7	.25	.28	.32	.34	.35	.36
	8	.22	.25	.27	.29	.30	.30
	9	.19	.21	.24	.25	.26	.26
	10	.17	.19	.21	.22	.23	.23
4	1	.48	.84	.93	.95	.96	.97
	2	.46	.66	.78	.82	.85	.86
	3	.42	.53	.64	.69	.73	.75
	4	.37	.44	.52	.58	.62	.64
	5	.33	.38	.44	.49	.52	.54
	6	.29	.33	.38	.41	.43	.45
	7	.26	.29	.33	.35	.37	.37
	8	.22	.26	.28	.30	.31	.32
	9	.20	.22	.25	.26	.26	.27
	10	.18	.19	.22	.23	.23	.24
5	1	.48	.84	.93	.95	.97	.97
	2	.46	.68	.83	.85	.86	.87
	3	.42	.57	.67	.71	.75	.77
	4	.37	.48	.57	.61	.64	.66
	5	.33	.42	.48	.52	.54	.56
	6	.30	.36	.40	.43	.45	.47
	7	.27	.30	.34	.36	.37	.38
	8	.23	.26	.29	.30	.31	.32
	9	.20	.23	.25	.26	.27	.27
	10	.18	.20	.22	.23	.24	.25

Points Along Width of Room

M.E. ILLUMINATION ENGINEERING 1st YEAR 1ST SEMESTER EXAMINATION 2024

TIME: 3 HOUR

FULL MARKS: 100

SUBJECT: LIGHTING DESIGN AND CALCULATION

(Answer separate Answer script for each part)

PART-II (40 Marks)

ANSWER ANY THREE QUESTIONS

(Q.No.1 CARRIES 14 MARKS)

Q.1. Answer the followings-

- (A) Why luminance is expressed in terms of projected area? How it is related to luminous intensity?
- (B) What is difference between point-specific illuminance and average illuminance? How these two are related?
- (C) Derive the mathematical expression of the inverse square cosine law of illuminance from Flux Transfer theory.

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Q.2. (A) Write down the principle of homogeneity of intensity distribution applicable for a non-diffuse area source.

(B) Compute average illuminance on a receiving area due to a diffuse area source mounted at the ceiling in a room applying flux transfer theory.

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Q.3. A) What are the indoor lighting design parameters?

B) Write down the computational steps of any three out the above parameters.

13

Q.4. Derive the matrix equation of total illuminance (direct and indirect) computation by finite element method for an indoor space.

13

Q.5. Write down notes on any one from the followings-

- i) Computation of indirect illuminance for an indoor space;
- ii) Flux transfer theory and point-specific illuminance computation.

13