Ref. No.: Ex/PG/IlluTD/T/123A/2024

M.TECH ILLUMINATION TECH. AND DESIGN FIRST YEAR SECOND SEMESTER – 2024

INDOOR LIGHTING DESIGN

Time 3 hrs **Full Marks: 100**

Part I (Each part carrying 50 marks)

Use Separate Answer scripts for each part

Answer Question No. 1 and any two (2) questions from rest.

1. What do you mean by COU? What are the factors that affect COU and How? Write down the purpose of using correction factor for COU.
An indoor space is evenly illuminated with luminaires having total lumen output of 9000 lm. Dimension of room is length 15 ft and width 10 ft. other details are shown in figure 2. Find out COU using Table 1, 2, 3 and calculate average illuminance on the working plane. Consider LLF = 0.7. 3+4+3+8

2. In an office room of 4m X 4m X 2.8m as shown in Fig. 3 is illuminated with four symmetrically placed luminaires of dimension 600mm X 600mm. Considering reflection factors 0.7, 0.5 & 0.3 respectively for Ceiling, Walls & Floor, DLOR=0.5, MF=0.65, UF(c)=0.15, UF(w)=0.45, UF(f)=0.6, inter illuminance scalar factor of Ceiling = 0.245, inter illuminance cylindrical factor=0.125, find out the direct flux/klm for one luminaire (using inverse square Law) at the centre of each small area, total working plane being divided in 16 small equal areas using given table 4
Calculate the illuminance at a point 5 feet below the center of an 8-foot fluorescent luminaire with intensities as given in table 5 8+8

3. Describe the method of measuring effective cavity reflectance for non horizontal ceiling.
A saw tooth roof is shown in figure 1. Reflectance of different surfaces are $S_1 = S_3 = 50$ %, and $S_2 = 10$ % , L = 100 ft, W = 20 ft, $W_1 = 20$ ft and $W_2 = 11$ ft. Find out the effective ceiling cavity reflectance.
Briefly explain the factors responsible for light loss. 5+7+4

4. Mention the significance of direct ratio for calculating COU. Calculate Direct ratio for an indoor space with RCR = 1, reflectance values are ceiling = 80%, Wall = 50 and Floor = 20% with luminaire having candela distribution as shown in table 6. The luminaire having HPSV lamp of 400 Watt with total lumen output of 50000 lm.
Write down a short note on Quantitive & Qualititive evaluation for indoor lighting design. 3+9+4

[Turn over

5. Mention the factors to be considered while in lighting design for an Indoor space and the different design parameters that it should meet.

It is desired to illuminate a drawing hall of 30meter by 20 meter dimension with an average illumination of 200 lux. The lamps having efficiency of 20 lm/Watt fitted from ceiling. Find out the number of lamps & wattage of the lamp, where mounting height 4 meter, COU = 0.75, depreciation factor 0.8. Mention satisfactory spacing arrangement and show space to height ratio.

How inverse square law can be applicable to find out illuminance from a larger source?

4+9+3

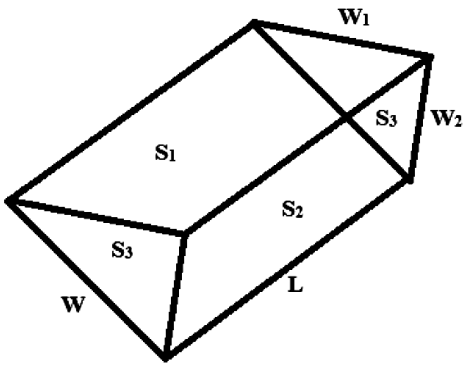

Figure 1

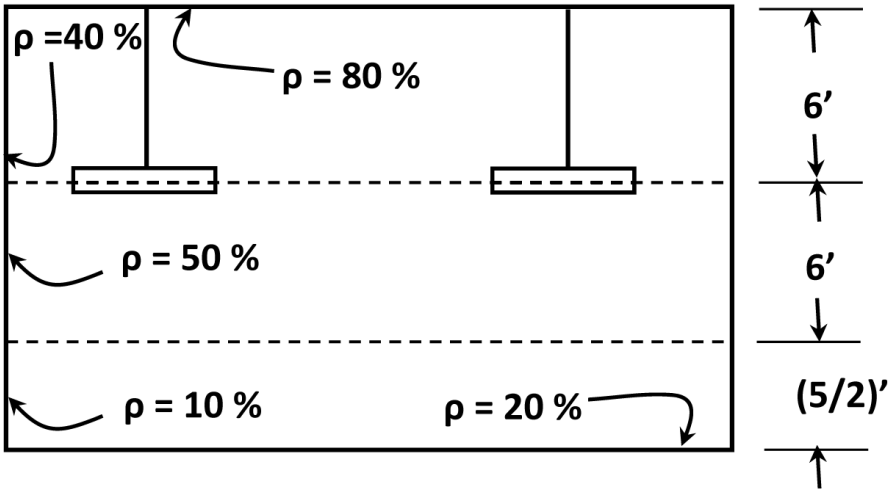

Figure 2

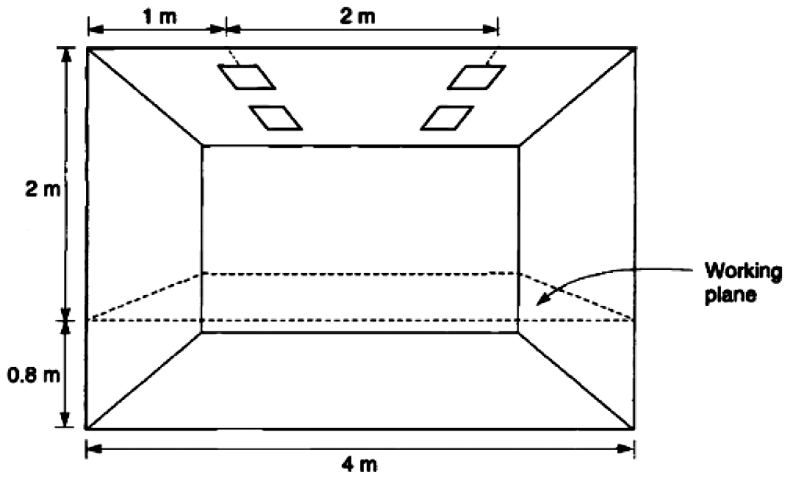

Figure 3

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Table 1(a)

Percent Base† Reflectance	40										30										20										10										0									
Percent Wall 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	90	80	70	60	50	40	30	20	10	0
Cavity Ratio																																																		
0.2	40	40	39	39	39	38	38	37	36	36	31	31	30	30	29	29	29	28	28	27	21	20	20	20	20	20	19	19	19	17	11	11	11	10	10	10	10	09	09	09	02	02	02	01	01	01	01	00	00	0
0.4	41	40	39	39	38	37	36	35	34	34	31	31	30	30	29	28	28	27	26	25	22	21	20	20	20	19	19	18	18	16	12	11	11	11	11	10	10	09	09	08	04	03	03	02	02	02	01	01	00	0
0.6	41	40	39	38	37	36	34	33	32	31	32	31	30	29	28	27	26	26	25	23	23	21	21	20	19	19	18	18	17	15	13	13	12	11	11	10	10	09	08	08	05	05	04	03	03	02	02	01	01	0
0.8	41	40	38	37	36	35	33	32	31	29	32	31	30	29	28	26	25	25	23	22	24	22	21	20	19	19	18	17	16	14	15	14	13	12	11	10	10	09	08	07	07	06	05	04	04	03	02	02	01	0
1.0	42	40	38	37	35	33	32	31	29	27	33	32	30	29	27	25	24	23	22	20	25	23	22	20	19	18	17	16	15	13	16	14	13	12	12	11	10	09	08	07	08	07	06	05	04	03	02	02	01	0
1.2	42	40	38	36	34	32	30	29	27	25	33	32	30	28	27	25	23	22	21	19	25	23	22	20	19	17	17	16	14	12	17	15	14	13	12	11	10	09	07	06	10	08	07	06	05	04	03	02	01	0
1.4	42	39	37	35	33	31	29	27	25	23	34	32	30	28	26	24	22	21	19	18	26	24	22	20	18	17	16	15	13	12	18	16	14	13	12	11	10	09	07	06	11	09	08	07	06	04	03	02	01	0
1.6	42	39	37	35	32	30	27	25	23	22	34	33	29	27	25	23	22	20	18	17	26	24	22	20	18	17	16	15	13	11	19	17	15	14	12	11	09	08	07	06	12	10	09	07	06	05	03	02	01	0
1.8	42	39	36	34	31	29	26	24	22	21	35	33	29	27	25	23	21	19	17	16	27	25	23	20	18	17	15	14	12	10	19	17	15	14	13	11	09	08	08	05	13	11	09	08	07	05	04	03	01	0
2.0	42	39	36	34	31	28	25	23	21	19	36	33	29	26	24	22	20	18	16	14	28	25	23	20	18	16	15	13	11	09	20	18	16	14	13	11	09	08	08	05	14	12	10	09	07	05	04	03	01	0
2.2	42	39	36	33	30	27	24	22	19	18	36	32	29	26	24	22	19	17	15	13	28	25	23	20	18	16	14	12	10	09	21	19	16	14	13	11	09	07	06	05	15	13	11	09	07	06	04	03	01	0
2.4	43	39	35	33	29	27	24	21	18	17	36	32	29	26	24	22	19	16	14	12	29	26	23	20	18	16	14	12	10	08	22	19	17	15	13	11	09	07	06	05	16	13	11	09	08	06	04	03	01	0
2.6	43	39	35	32	29	26	23	20	17	15	36	32	29	25	23	21	18	16	14	12	29	26	23	20	18	16	14	11	09	08	23	20	17	15	13	11	09	07	06	04	17	14	12	10	08	06	05	03	02	0
2.8	43	39	35	32	28	25	22	19	16	14	37	33	29	26	23	21	17	15	13	11	30	27	23	20	18	15	13	11	09	07	23	20	18	16	13	11	09	07	06	03	17	15	13	10	08	07	05	03	02	0
3.0	43	39	35	31	27	24	21	18	15	13	37	33	29	25	22	20	17	15	12	10	30	27	23	20	17	15	13	11	09	07	24	21	18	16	13	11	09	07	06	03	18	16	13	11	09	07	05	03	02	0
3.2	43	39	35	31	27	23	20	17	15	13	37	33	29	25	22	19	16	14	12	10	31	27	23	20	17	15	12	11	09	08	25	21	18	16	13	11	09	07	06	03	19	16	14	11	09	07	05	03	02	0
3.4	43	39	34	30	26	23	20	17	14	12	37	33	29	25	22	19	16	14	11	09	31	27	23	20	17	15	12	10	08	06	26	22	18	16	13	11	09	07	06	03	20	17	14	12	09	07	05	03	02	0
3.6	44	39	34	30	26	22	19	16	14	11	38	33	29	24	21	18	15	13	10	09	32	27	23	20	17	15	12	10	08	05	26	22	19	16	13	11	09	06	04	03	20	17	15	12	10	08	05	04	02	0
3.8	44	38	33	29	25	22	18	16	13	10	38	33	28	24	21	18	15	13	10	08	32	28	23	20	17	15	12	10	07	05	27	23	19	17	14	11	09	06	04	02	21	18	16	12	10	08	05	04	02	0
4.0	44	38	33	29	25	21	18	15	12	10	38	33	28	24	21	18	14	12	09	07	33	28	23	20	17	14	11	09	07	05	27	23	20	17	14	11	09	06	04	02	22	18	15	13	10	08	06	04	02	0
4.2	44	38	33	29	24	21	17	15	12	10	38	33	28	24	20	17	14	12	09	07	33	28	23	20	17	14	11	09	07	04	28	24	20	17	14	11	09	06	04	02	22	19	16	13	10	08	06	04	02	0
4.4	44	38	33	28	24	20	17	14	11	09	39	33	28	24	20	17	14	11	08	06	34	28	24	20	17	14	11	09	07	04	28	24	20	17	14	11	08	06	04	02	23	19	16	13	10	08	06	04	02	0
4.6	44	38	32	28	23	19	16	14	11	08	39	33	28	24	20	17	13	11	08	06	34	29	24	20	17	14	11	09	07	04	29	25	21	17	14	11	08	06	04	02	23	20	17	13	11	08	06	04	02	0
4.8	44	38	32	27	22	19	16	13	10	08	39	33	28	24	20	17	13	11	08	05	35	29	24	20	17	13	10	08	06	04	29	25	21	17	14	11	08	06	04	02	24	20	17	14	11	08	06	04	02	0
5.0	45	38	31	27	22	19	15	13	10	07	39	33	28	24	19	16	13	11	08	05	35	29	24	20	16	13	10	08	06	04	30	25	21	17	14	11	08	06	04	02	25	21	17	14	11	08	06	04	02	0
6.0	44	37	30	26	20	17	13	11	08	06	38	33	27	23	18	15	11	09	06	04	36	30	24	20	16	13	10	08	06	02	31	26	21	18	14	11	08	06	03	01	27	23	18	15	12	09	06	04	02	0
7.0	44	36	29	24	19	16	12	10	07	04	40	33	26	22	17	14	10	08	05	03	36	30	24	20	15	12	09	07	04	02	32	27	21	17	13	11	08	06	03	01	28	24	19	15	12	09	06	04	02	0
8.0	44	35	28	23	18	15	11	09	06	03	40	33	26	21	16	13	09	07	04	02	37	30	23	19	15	12	08	06	03	01	33	27	21	17	13	10	07	05	03	01	30	25	20	15	12	09	06	04	02	0
9.0	44	35	26	21	16	13	10	08	05	02	40	33	25	20	15	12	09	07	04	02	37	29	23	19	14	11	08	06	03	01	34	28	21	17	13	10	07	05	02	01	31	25	20	15	12	09	06	04	02	0
10.0	43	34	25	20	15	12	08	07	05	02	40	32	24	19	14	11	08	06	03	01	37	29	22	18	13	10	07	05	03	01	34	28	21	17	12	10	07	05	02	01	31	25	20	15	12	09	06	04	02	0

Table 1(b)

Basef Reflectance	90										80										70										60										50									
Percent Wall 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	90	80	70	60	50	40	30	20	10	0
Cavity Ratio																																																		
0.2	89	88	88	87	86	85	85	84	84	82	79	78	78	77	77	76	76	75	74	72	70	69	68	68	67	67	66	66	65	64	60	59	59	59	58	57	56	56	55	53	50	50	49	49	48	48	47	46	46	44
0.4	88	87	86	85	84	83	81	80	79	76	79	77	75	75	74	73	72	71	70	68	69	68	67	66	65	64	63	62	61	58	60	59	59	58	57	55	54	53	52	50	50	49	48	48	47	46	45	45	44	42
0.6	87	86	84	82	80	79	77	76	74	73	78	76	75	73	71	70	68	66	65	63	69	67	65	64	63	61	59	58	57	54	60	58	57	56	55	53	51	51	50	46	50	48	47	46	45	44	43	42	41	38
0.8	87	85	82	80	77	75	73	71	69	67	78	75	73	71	69	67	65	63	61	57	68	66	64	62	60	58	56	55	53	50	59	57	56	55	54	51	48	47	46	43	50	48	47	45	44	42	40	39	38	36
1.0	86	83	80	77	75	72	69	66	64	62	77	74	72	69	67	65	62	60	57	55	68	65	62	60	58	55	53	52	50	47	59	57	55	53	51	49	45	44	43	41	50	48	46	44	43	41	39	37	36	34
1.2	85	82	78	75	72	69	66	63	60	57	76	73	70	67	64	61	58	55	53	51	67	64	61	58	57	54	50	48	46	44	59	56	54	51	49	46	44	42	40	38	50	47	45	43	41	39	36	35	34	29
1.4	85	80	77	73	69	65	62	59	57	52	76	72	68	65	62	59	56	53	50	48	67	63	60	58	56	51	47	45	44	41	58	56	53	49	47	44	41	39	38	36	50	47	45	42	40	38	35	34	35	27
1.6	84	79	75	71	67	63	59	56	53	50	75	71	67	63	60	57	53	50	47	44	67	62	59	56	53	47	45	43	41	38	59	55	52	48	45	42	39	37	35	33	50	47	44	41	39	36	33	32	30	26
1.8	83	78	73	69	64	60	56	53	50	48	75	70	66	62	58	54	50	47	44	41	66	61	58	54	51	46	42	40	38	35	58	56	51	47	44	40	37	36	33	31	50	46	43	40	38	35	31	30	28	25
2.0	83	77	72	67	62	58	53	50	47	43	74	69	64	60	56	52	48	45	41	38	66	60	56	52	49	45	43	38	36	33	58	54	50	46	43	39	35	33	31	29	50	45	43	40	37	34	30	28	26	24
2.2	82	76	70	65	59	54	50	47	44	40	74	68	63	58	54	49	45	42	38	35	66	60	55	51	48	43	39	36	34	32	58	53	49	45	42	37	34	31	29	28	50	45	42	38	36	33	29	27	24	22
2.4	82	75	69	64	58	53	48	46	41	37	73	67	61	56	52	47	43	40	36	33	65	60	54	50	46	41	37	35	32	30	58	53	48	44	41	36	32	30	27	26	50	45	42	37	35	31	27	25	23	21
2.6	81	74	67	62	56	51	46	42	38	35	73	66	60	55	50	45	41	38	34	31	65	59	54	49	45	40	36	33	30	28	58	53	48	43	39	35	31	28	26	24	50	45	41	37	34	30	26	23	21	20
2.8	81	73	66	60	54	49	44	40	36	34	73	65	59	53	48	43	39	36	32	29	65	59	53	48	43	38	33	30	28	26	58	53	47	43	38	34	29	27	24	22	50	45	41	36	33	29	25	22	20	19
3.0	80	72	64	58	52	47	42	38	34	30	72	65	58	52	47	42	37	34	30	27	64	58	52	47	42	37	32	29	27	24	57	52	46	42	37	32	28	25	23	20	50	45	40	36	32	28	24	21	19	17
3.2	79	71	63	56	50	45	40	36	32	28	72	65	57	51	45	40	35	33	28	25	64	58	51	46	40	36	31	28	25	23	57	51	46	41	36	31	27	23	22	18	50	41	39	35	31	27	23	20	18	16
3.4	79	70	62	54	48	43	38	34	30	27	71	64	55	49	44	39	34	32	27	24	64	57	50	45	39	35	29	27	24	22	57	51	45	40	35	30	26	23	20	17	50	44	39	35	30	26	22	19	17	15
3.6	78	69	61	53	47	42	36	32	28	25	71	63	54	48	43	38	32	30	25	23	63	56	49	44	38	33	28	25	22	20	57	50	44	39	34	29	25	22	19	16	50	44	39	34	29	25	21	18	16	14
3.8	78	69	60	51	45	40	35	31	27	23	70	62	53	47	41	36	31	28	24	22	63	56	49	43	37	32	27	24	21	19	57	50	43	38	33	29	24	21	19	16	50	44	38	34	29	25	21	17	15	13
4.0	77	69	58	51	44	39	33	29	25	22	70	61	53	46	40	35	30	26	22	20	63	55	48	42	36	31	26	23	20	17	57	49	42	37	32	28	23	20	18	14	50	44	38	33	28	24	20	17	15	12
4.2	77	62	57	50	43	37	32	28	24	21	69	60	52	46	39	34	29	26	21	18	62	55	47	41	35	30	25	22	19	16	56	49	42	37	32	27	22	19	17	14	50	43	37	32	28	24	20	17	14	12
4.4	76	61	56	49	42	36	31	27	23	20	69	60	51	44	38	33	28	24	20	17	62	54	46	40	34	29	24	21	18	15	56	49	42	36	31	27	22	19	16	13	50	43	37	32	27	23	19	16	13	11
4.6	76	60	55	47	40	35	30	26	22	19	69	59	50	43	37	32	27	23	19	15	62	53	45	39	33	28	24	21	17	14	56	49	41	35	30	26	21	18	16	13	50	43	36	31	26	22	18	15	13	10
4.8	75	59	54	46	39	34	29	25	21	18	68	58	49	42	36	31	26	22	18	14	62	53	45	38	32	27	23	20	16	13	56	48	41	34	29	25	21	18	15	12	50	43	36	31	26	22	18	15	12	09
5.0	75	59	53	46	38	33	28	24	20	16	68	58	48	41	35	30	25	21	18	14	61	52	44	36	31	26	22	19	16	12	56	48	40	34	28	24	20	17	14	11	50	42	35	30	25	21	17	14	12	09
5.0	73	61	49	41	34	29	24	20	16	11	66	55	44	38	31	27	22	19	15	10	60	51	41	35	28	24	19	16	13	09	55	45	37	31	25	21	17	14	11	07	50	42	34	29	23	19	15	13	10	06
.0	70	58	45	38	30	27	21	18	14	08	64	53	41	35	28	24	19	16	12	07	58	48	38	32	26	22	17	14	11	06	54	43	35	30	24	20	15	12	09	05	49	41	32	27	21	18	14	11	08	05
.0	68	55	42	35	27	23	18	15	12	06	62	50	38	32	25	21	17	14	11	05	57	46	35	29	23	19	15	13	10	05	53	42	33	28	22	18	14	11	08	04	49	40	30	25	19	16	12	10	07	03
.0	66	52	38	31	25	21	16	14	11	05	61	49	36	30	23	19	15	13	10	04	56	45	33	27	21	18	14	12	09	04	52	40	31	26	20	16	12	10	07	03	48	39	29	24	18	15	11	09	07	03
.0	65	51	36	29	22	19	15	11	09	04	59	46	33	27	21	18	14	11	08	03	55	43	31	25	19	16	12	10	08	03	51	39	29	24	18	15	11	09	07	02	47	37	27	22	17	14	10	08	06	02

Table-2

Luminaire specific CU Table

ρ_{cc} →	80			70			50			30			10			0
ρ_w →	50	30	10	50	30	10	50	30	10	50	30	10	50	30	10	0
RCR ↓	Coefficients of Utilization for 20 Per Cent Effective Floor Cavity Reflectance (ρ_{fc} = 20)															
0	.75	.75	.75	.73	.73	.73	.70	.70	.70	.67	.67	.67	.64	.64	.64	.63
1	.67	.65	.63	.66	.64	.62	.63	.62	.60	.61	.60	.58	.59	.58	.57	.55
2	.60	.57	.54	.59	.56	.53	.57	.54	.52	.55	.53	.51	.53	.51	.50	.49
3	.54	.50	.47	.53	.49	.46	.52	.48	.45	.50	.47	.45	.48	.46	.44	.43
4	.49	.44	.40	.48	.44	.40	.47	.43	.40	.45	.42	.39	.44	.41	.39	.37
5	.44	.39	.35	.43	.38	.35	.42	.38	.34	.41	.37	.34	.40	.36	.34	.33
6	.40	.34	.31	.39	.34	.31	.38	.34	.30	.37	.33	.30	.36	.32	.30	.29
7	.36	.30	.27	.35	.30	.27	.34	.30	.27	.33	.29	.26	.32	.29	.26	.25
8	.32	.27	.23	.32	.27	.23	.31	.26	.23	.30	.26	.23	.29	.26	.23	.22
9	.29	.24	.20	.28	.23	.20	.28	.23	.20	.27	.23	.20	.26	.23	.20	.19
10	.26	.21	.18	.26	.21	.18	.25	.21	.18	.24	.20	.18	.24	.20	.18	.16

Table-3

% Effective Ceiling Cavity Reflectance, ρ_{cc}	80				70				50			30			10		
% Wall Reflectance, ρ_w	70	50	30	10	70	50	30	10	50	30	10	50	30	10	50	30	10
For 30% Effective Floor Cavity Reflectance (20% – 1.00)																	
Room Cavity Ratio																	
1	1.092	1.082	1.075	1.068	1.077	1.070	1.064	1.059	1.049	1.044	1.040	1.028	1.026	1.023	1.012	1.010	1.008
2	1.079	1.066	1.056	1.047	1.068	1.057	1.048	1.039	1.041	1.033	1.027	1.026	1.021	1.017	1.013	1.010	1.006
3	1.070	1.054	1.042	1.033	1.061	1.048	1.037	1.028	1.034	1.027	1.020	1.024	1.017	1.012	1.014	1.009	1.005
4	1.062	1.045	1.033	1.024	1.055	1.040	1.029	1.021	1.030	1.022	1.015	1.022	1.015	1.010	1.014	1.009	1.004
5	1.056	1.038	1.026	1.018	1.050	1.034	1.024	1.015	1.027	1.018	1.012	1.020	1.013	1.008	1.014	1.009	1.004
6	1.052	1.033	1.021	1.014	1.047	1.030	1.020	1.012	1.024	1.015	1.009	1.019	1.012	1.006	1.014	1.008	1.003
7	1.047	1.029	1.018	1.011	1.043	1.026	1.017	1.009	1.022	1.013	1.007	1.018	1.010	1.005	1.014	1.008	1.003
8	1.044	1.026	1.015	1.009	1.040	1.024	1.015	1.007	1.020	1.012	1.006	1.017	1.009	1.004	1.013	1.007	1.003
9	1.040	1.024	1.014	1.007	1.037	1.022	1.014	1.006	1.019	1.011	1.005	1.016	1.009	1.004	1.013	1.007	1.002
10	1.037	1.022	1.012	1.006	1.034	1.020	1.012	1.005	1.017	1.010	1.004	1.015	1.009	1.003	1.013	1.007	1.002
For 10% Effective Floor Cavity Reflectance (20% 1.00)																	
Room Cavity Ratio																	
1	.923	.929	.935	.940	.933	.939	.943	.948	.956	.960	.963	.973	.976	.979	.989	.991	.993
2	.931	.942	.950	.958	.940	.949	.957	.963	.962	.968	.974	.976	.980	.985	.988	.991	.995
3	.939	.951	.961	.969	.945	.957	.966	.973	.967	.975	.981	.978	.983	.988	.988	.992	.996
4	.944	.958	.969	.978	.950	.963	.973	.980	.972	.980	.986	.980	.986	.991	.987	.992	.996
5	.949	.964	.976	.983	.954	.968	.978	.985	.975	.983	.989	.981	.988	.993	.987	.992	.997
6	.953	.969	.980	.986	.958	.972	.982	.989	.977	.985	.992	.982	.989	.995	.987	.993	.997
7	.957	.973	.983	.991	.961	.975	.985	.991	.979	.987	.994	.983	.990	.996	.987	.993	.998
8	.960	.976	.986	.993	.963	.977	.987	.993	.981	.988	.995	.984	.991	.997	.987	.994	.998
9	.963	.978	.987	.994	.965	.979	.989	.994	.983	.990	.996	.985	.992	.998	.988	.994	.999
10	.965	.980	.989	.995	.967	.981	.990	.995	.984	.991	.997	.986	.993	.998	.988	.994	.999
For 0% Effective Floor Cavity Reflectance (20% – 1.00)																	

Table 4

Angle (deg)	Mean luminaire intensity in vertical plane cd/1000 lumens
0	218
5	218
10	215
15	211
20	205
25	197
30	186
35	167
40	139
45	107
50	82
55	70
60	44
65	31
70	23
75	17
80	13
85	8
90	0

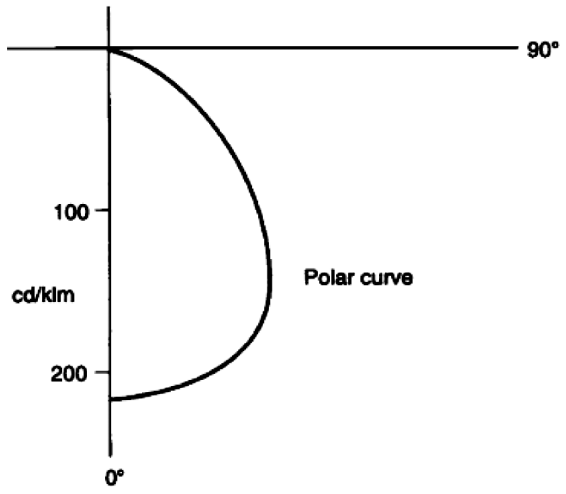

Table 5

Θ (Degree)	I (cd)	θ (Degree)	I (cd)
0	4000	20	3679
2.5	3989	22.5	3592
5	3975	25	3496
7.5	3951	27.5	3398
10	3913	30	3292
12.5	3863	32.5	3169
15	3812	35	3045
17.5	3745		

Table 6

$\theta°$	Intensity	$\theta°$	Intensity
5	28800	95	25
15	25950	105	25
25	21300	115	225
35	13700	125	525
45	6350	135	825
55	3475	145	1000
65	1000	155	1600
75	125	165	1650
85	75	175	825

Zone	A	B
1	0.	0.
2	0.041	0.98
3	0.070	1.05
4	0.100	1.12
5	0.136	1.16
6	0.190	1.25
7	0.315	1.25
8	0.640	1.25
9	2.10	0.80

Ref. No.: Ex/PG/IlluTD/T/123A/2024

M.TECH ILLUMINATION TECH. AND DESIGN FIRST YEAR SECOND SEMESTER – 2024

SUBJECT: - INDOOR LIGHTING DESIGN

Time: Three hours | Full Marks: 100 (50 marks for this part)

Use Separate Answer scripts for each part, Answer any ***five questions*** **Page 1 of 2**

PART- II

1. (a) What is the effect of glare in lighting design? 3
   (b) Describe different factors that can affects indoor lighting system. 7

2. (a) Explain the procedure of indoor lighting system with the help of necessary steps. 7
   (b) What is the role of space-height ratio in indoor lighting design? 3

3. (a) During indoor lighting design calculation, on what factors the COU depends? 4

   (b) A room of 15 m x 9 m is to be illuminated to a level of 200 lux. The co-efficient of utilization is 0.75 and the maintenance factor is 0.8. Calculate the number of lamps required to be illuminate the whole area, if the lumen output of the lamp selected is 3000 lumens. 6

4. How to calculate the total number of lamps in a room using the lumen formula? Also, show the required layout by arranging the lamps according to row and column wise with proper spacing. 10

5. A workshop 16 m x 10 m is to be illuminated with 200 W incandescent lamps. If 200 lux is required at the working plane, then calculate the number of luminaire. (Assume, lumen output of 200 W lamp = 2950 lumen, COU= 0.7, M.F= 0.75). Calculate the number of sub circuit with proper layout. 10

6. (a) What is Stroboscopic Effect? Describe briefly various processes for reducing the Stroboscopic Effect. 5
   (b)What needs to be considered during indoor lighting design in a residential building? 5

7. (a) Discuss the different types of lighting schemes. 4

(b) A lamp is giving out 1200 lumen in all directions is suspended 8 m above the working plane. Calculate the illuminance at a point on the working plane 6 m away from the foot of the lamp. 6

8. Write short notes on any two: 5x2

(a) Coefficient of utilization
(b) Colour Rendering Index
(c) Non-planar illuminance