Ref: PG/IlluTD/T/141B/2024

M.Tech. Illumination Technology & Design 2nd Year 2nd Semester Examination 2024

Time: 3 Hours Full marks 100

Subject: Daylighting Design & Analysis

Answer any Five Questions

Q.1.A) Briefly discuss the CIE Standard sky luminance distribution model with suitable diagram.
B) Determine the luminance of the sky element ($\alpha=120^0$ from North, $\gamma=20^0$) using the following data-
i) Sun position ($\alpha_s=150^0$ from North, $\gamma_s=45^0$); ii) Standard sky type:VI.6 (white blue turbid sky with broad solar corona); iii) Standard sky parameters: a=-1.0, b=-0.15, c=24, d=-2.8, e-0.15; iv) Zenith luminance(L_z)=4.5 kcd/m^2.

10+10=20

Q.2. Derive the expression of point-specific horizontal illuminance due to an unobstructed sky from the basic law of illuminance and hence show that $E_{ext,H}=\frac{7\pi}{9}.L_z$ for CIE Standard Overcast sky [$L_\gamma=\frac{L_z}{3}(1+2.\mathrm{Sin}(\gamma))$]. Symbols have their usual meaning.

20

Q.3.A) Define Daylight Coefficient(DC) and Daylight Factor(DF) with corresponding mathematical expressions and hence explain why DC method is considered as realistic daylight prediction tool.
B) Derive the expression of DC for point-specific horizontal illuminance computation.

8+12=20

Q.4. A) What are the design metrics need to be considered during conceptual design of possible daylighting schemes applicable for an indoor environment? Briefly explain their significance.
B) Discuss 'design goal' and 'approach' of any two of the above design metrics.

8+12=20

Q.5. A) What do you understand by the daylighting design schemes? Give examples.
B) Compare between the two commonly used schemes in terms of (i) shape; (ii) placement; (iii) daylight distribution within interior; (iv) advantages and limitations.

5+15=20

Q.6. A) What are the energy related parameters of glazing system to be considered during design of a daylighting scheme?
B) Briefly discuss any two from the above parameters with suitable examples.

4+16=20

Q.7. A) What is the advantage and challenges of a daylight integrated artificial lighting system?
B) Write down mathematical expressions of (i) Global daylight luminous efficacy and (ii) Diffuse daylight luminous efficacy. How these are measured in practice?

10+10=20