

Some Lighting Questions

- 1 a) Describe a sequence of design that might be adopted for the design of a lighting installation with a regular array of luminaires.
- b) Describe the luminaire characteristics that are available to the designer and the significance of each to the performance and visual appearance of the lighting installation.
- c) Briefly describe one electric lighting installation which has impressed you, whether it be favourably or unfavourably. Use sketches where possible to help in this description. Explain what it is about the installation that has impressed itself upon you and describe any lessons you have learnt from it.

- 2 List the characteristics that may be used to describe lamps and explain the significance of each to the lighting designer.

- 3 a) Briefly describe the process of design for a lighting installation comprising a regular array of luminaires intended to produce a uniform illuminance on the working plane. It is important that you make clear the order in which various decisions are made and the relevance of the various aspects of the design.
- b) Determine the Direct Ratio and Flux Fraction Ratio of the lighting installation needed to achieve the following illuminance ratios;

$$\frac{E_w}{E_{wp}} = 0.5 , \frac{E_c}{E_{wp}} = 0.3 .$$

Where, E_w , E_{wp} and E_c are respectively the illuminances on the walls, working plane and ceiling.

The room to be illuminated is 12m long by 8m wide by 4.2m high with the reflectance of the working plane, effective ceiling plane and walls being respectively, 0.2, 0.6 and 0.4. The working plane is 0.8m above the floor and the luminaires are suspended 1m from the ceiling.

- 4 a) Describe the various properties of lamps and explain their significance to the lighting designer.

5 Briefly explain how consideration of the following properties may influence the choice of lamp:

- | | |
|--------------------------|-----------------------------|
| a) Efficacy | b) Life |
| c) Colour | f) Optical Size |
| g) Lumen Package | h) Lumen Maintenance |
| i) Variability | j) Starting Characteristics |
| k) Need for Control Gear | l) Initial Cost |

Wherever possible illustrate your answer with examples.

6 Explain what you understand by the term 'the modelling of light' and contrast the effects of weak modelling upon a curvaceous form with harsh modelling upon an angular solid.

- 7
- a) Describe what is meant by the term 'colour rendering' of light sources.
 - b) Describe the factors that a designer would need to consider when choosing the colour of light emitted by a lamp.
 - c) Discuss the reasons for accepting or rejecting the use of the particular lamps given in the examples below:
 - i) a fluorescent lamp in a small storage cupboard accessed at infrequent intervals,
 - ii) a high pressure discharge lamp in an intermittently used cellular office,
 - iii) a high pressure sodium lamp in a large colour print works,
 - iv) tungsten halogen lamps in a large drawing office.

8 Write a short description of the qualitative factors that need to be considered when designing an electric lighting installation

- 9 a) Show that N_{\min} , the minimum number of luminaires that may be used in a lighting installation, is given by:

$$N_{\min} = \frac{A_{wp}}{(S_{\max})^2}.$$

Where A_{wp} = area of the working plane,
 S_{\max} = maximum allowable luminaire spacing.

- b) Describe those factors that might influence the designer to use a number of luminaires greater or less than the minimum number.
- c) Describe the factors which would influence the type of light distribution chosen for a luminaire used in a lighting installation comprising a regular array of luminaires.
- d) Discuss the advantages and disadvantages of using the various optical mechanisms to control the distribution of light from a luminaire.
- 10 a) Describe the reasons that would determine the choice of particular distributions of light onto the various room surfaces when designing a lighting installation.
- b) Describe two qualitative aspects of the design of an electric lighting installation that is designed as a regular array, and explain how they might influence the design of the following:
- i) Lecture theatre,
 - ii) A deep plan office,
 - iii) Gallery for displaying architectural and engineering drawings.
- c) Briefly explain the importance of the colour and colour rendering of an electric lamp when choosing a light source for an electric lighting installation.
- 11 a) Describe the significance of the following in the design of an electric lighting installation
- i) Disability glare
 - ii) Discomfort glare
 - iii) Reflected glare
 - iv) Vector/scalar ratios

- 12
 - a) Describe the significance of the CIE flux numbers.
 - b) How are the CIE flux numbers used to estimate the Utilization Factor of a lighting installation.
 - c) Describe one other method of estimating the UF of a lighting installation.

- 13
 - a) What is meant by the term 'modelling of light'
 - b) Describe a means of specifying the modelling effect of light.
 - c) Describe some of the differences between electric lighting installations and daylighting.