| Reg. No. | | | | | | | | | |
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# MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

*A Constituent Institution of Manipal University*

## VII SEMESTER B.TECH (ELECTRICAL & ELECTRONICS ENGINEERING)

## END SEMESTER EXAMINATIONS, NOV/DEC 2016

## SUBJECT: ILLUMINATION TECHNOLOGY [ELE 405]

REVISED CREDIT SYSTEM

**Time: 3 Hours** **Date: 28 November 2016** **MAX. MARKS: 50**

**Instructions to Candidates:**

- Answer **ANY FIVE FULL** questions.
- Missing data may be suitable assumed.

**1A.** "Human vision is dependent of spectral eye sensitivity and lighting levels", justify this statement with the help of neat sketches. ***04***

**1B.** With the help of neat sketches explain the concept of specular and spread reflections. ***03***

**1C.** A 60 W spherical incandescent light bulb has a luminous flux of 1000 lm. The bulb emits light uniformly in all directions.

a. What is the luminous efficacy of the light bulb?

b. What number of standardized candles emit the same luminous intensity?

c. What is luminance emitted by the bulb? Assume a bulb diameter of 60mm. ***03***

**2A.** Starting from Planck's law deduce Wien's displacement law? What does Wien's displacement law indicate? ***03***

**2B.** With neat sketch explain the V-I characteristics of gas discharge. Highlight important transitions in the characteristics. ***03***

**2C.** In a room of dimension 6m×6m×4m, a recessed LED downlighter is positioned in the center of the room. The photometric data of the LED downlighter is given in Table 1. Assuming a grid size of 1m×1m, determine illuminance on the grids at all points along the diagonal of the room. ***04***

**3A.** For the LED downlighter whose photometric data is given in Table1, what is CIE classification based on symmetry and on light output? ***02***

**3B.** Draw a neat sketch of a High-pressure mercury vapor lamp and label the important parts. ***04***

**3C.** What are the different optical control elements used in a Luminaire? Explain their functions in brief. ***04***

**4A.** Determine the total luminous flux output of the LED downlighter whose photometric data is given in Table1. Also, estimate the flux fraction ratios. ***04***

**4B.** Design a suitable lighting scheme for a class room of 10mx8mx4m (LWH) dimensions using the LED downlighter whose photometric data is given in Table 1. The required illuminance level is 300 lux, assume MF = 0.8 and UF = 0.75, give the lighting layout and calculate LPD for the design. ***03***

**4C.** What is glare? How glare can be minimized in an interior? ***03***

**5A.** A classroom has a dimension of 10m x 7m x 3.8m. If the sitting arrangement is done ***03***

lengthwise in the room, compute the initial glare index using data in Table 2.

**5B.** Explain the following terms with respect to exterior lighting: ***04***

a. Waste light factor

b. Beam lumens

c. Beam angle

d. Depreciation factor

**5C.** What information is contained in a photometric data file? What is the file format for photometric data? How is the photometric data file generated? ***03***

**6A.** Briefly explain the criterions that decide the quality and quantity of light in Sports. ***04***

**6B.** With neat relevant sketches, explain how the following geometrical variables affect the performance of road lighting: ***03***

a. Overhang b. Mounting Height

**6C.** What is daylighting? How does daylighting help in energy saving? ***03***

**Table 1 : Photometric data of 11W, 6" REALITY LED RECESSED DOWNLIGHT, 1000 lumens**

| γ in deg | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 |
|---|---|---|---|---|---|---|---|---|---|---|
| I (Cd) | 1544 | 1475 | 1265 | 982 | 704 | 494 | 367 | 292 | 229 | 161 |
| γ in deg | 50 | 55 | 60 | 65 | 70 | 75 | 80 | 85 | 90 | |
| I (Cd) | 88 | 37 | 12 | 12 | 10 | 8 | 3 | 1 | 0 | |

**Table 2 : UGR table**

| **Room Dimensions** | | **Glare Index** |
|---|---|---|
| **X** | **Y** | |
| 2H | 3H | 18 |
| | 5H | 19.2 |
| 4H | 3H | 18.3 |
| | 5H | 19.8 |