PHYSICS

BOOKS - NN GHOSH PHYSICS (HINGLISH)

PHOTOMETRY

Example

1. Two 16 candela lamps are placed on the same side of a secreen at distance of 2 m and

5 m form it. Caluclate the distance at which a single 32 candela lamp must be placed in order to give the same intensity of illumination.

2. Two lamps balance on the shadow photometer at distance of $0.60m$ and $0.42m$ from the screen. The stronger is then covered with a glass shade whicht transmits 80% of

the incident light. How far must be the other lamp be displaced in order to restore balance?

3. A lamp of 120 candela hangs at a height of 4 m excathy above the centre of a circular table of diameter of 6.m Caluclate the illuminance at the centre and at the edge of the table.

4. A convex lens of diameter D and foacal length f projects a small object at a great distance from the lens on to a secrrn. Calculate the illuminance of the image in terns of luminance L of the object diameter D and focal length f.

5. A Lamber source has a luminance L. Find:

(a) the luminuous flux emitted by an element

ΔS of this surface into the forward cone along the normal to ΔS and of semivertical angle θ,

(b) the luminosiy of such a source.

6. A point source is suspended at a height h over the centre of a round. Table The lumious intensity. P of the source depends on the direction θ with the normal function Pθ in terms of θ, assuming that $P(0) = P_0$

Exercises

1. An electric lamp hangs 3 m above one end of a table, which is 4 m long. Compare the intensity of illumination at the two ends of the table.

2. Two sources of lights of illuminating powers in the ratio1:2 are placed on a line 2 meter apart. At what point is the spae between them equally illuminated?

3. In the grease spot photometer, a lamp with dirty chimney is found to balance an electric lamp of constant illuminating power at a distance of 0.1 m from the spot. When the

chimney is cleaned, the electric lamp has to be shifted by 2 cm to obtain a balance. Calculate the precentage of light absorbed by the dirty chimney

4. A photographic print is found satisfactory when the exposure was for 16 s at a distance of 20 m from a 25-watts lamp. At what distance must the same paper be held from a

50-watts lamp in order that an exposure of 25

a may give the same result?

5. A lamp of luminous intensity 50 candela is

placed at a distancde of 1 m from a wall What

is the illuminacnce of the wall directly in front

of lamp ? If another lamp of 100 cd is placed

on the same line at a distance of 125 cm what

is the illuminance now?

6. A book placed at a distance of 30 cm from a candle can be read. What is the maximum distance at which a lamp of 32 candela can be still possible to read The book ?

7. A secreen is illuminated by a lamp which is one metre away. A sheet of glass is placed between the screeen and the lamp which has to be moved 10 cm nearer to maintain the

same intensity of illumination as before. What fraction of light is absorbed by the sheet of glass?

8. A lamp of luminous intensity 100 cd is held at a distance of 2 m from a vertical wall. A plane mirror is fixexd on the opposite wall which is at a distance of 4 m from the lamp. Calculate the illumainance on the wall opposite to the mirror at a point on the

horizontal line through the lamp. Also calculate the luminous flux on a small area or $0.02m^2$ surrounding the point.

9. An infinite number of lamps, each of luminous intensity 100 cd are placed 1 m apart in a horizontal line perpendicular to a wall. The nearest being 1 m from the wall. Calculate the illuminance at a point on the wall lying on

the line through the lamps.

Given $\sum\limits_{1} = 1/n^2 = \pi^2/6$

10. At what height should a lamp be hung above the centre of a round table of radius R to otain the maximum illumination at its edges?

11. A cylindrical hall of diameter D and height h is illuminated by a lamp fixed at the centre of the celing. Compare the minimum illumination of the froor.

12. A point light source illuminates a screen the, maximum illuminance being I_0 How will the illuminance of this point change if a large plane mirror or 100% reflectance is placed

behind the source at half the distance between the source and the screen?

13. A small lamp having the from of a unifromly sphere of radius R=6 cm is suspended at a height h=3m above the floor. The luminance of the lampis equal to $L = 2 \times 10^4 cd/m^2$. Find the illuminance of the floor below the lamp.

(Hint:$P = \sum L\Delta S \cos \theta = L \times \pi R^2$)

14. street lamps of 10 cm diameter and $1.8 \times 10^5 cdm^2$ luminance are suspended at a height of 12 m the distance bewteen them being 40 m Find the illuminance under each lamp and mid-way between them.

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15. An electric lamp of 100 cd consumes 0.5 watt of electrical energy per candela. Calculate

the efficiency of this lamp if the mechaniacal equivalent of ligt, is 0.00161 watt per lumen.

16. Find the average illuminance of the irradiated part of an opaque sphere receiving.

(a) a parallel luminous flux producing illuminance I_0 at point of normal incidence,

17. A luminious hemispherical dome rests on a horizontal plane. Find the illuminance at the centre of the plane if its luminances in L and is independent of direction.

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18. A lambert source has the from of an infinte plane. Its luminance is L. Find the illuminance of a small area parallel to the plane.

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19. Determine the luminosity of a surface whose luminance depends on direction as $L = L_0 \cos \theta$, where θ is the angle between the radiation direction and the normal to the surface.

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20. Two light sources of luminous intensities P and 2P are placed 2 m apart on a horizontal line. The edge of a right dihedral formed two

indentical opaque plates is placed on that line

a distance x from the stronger source. At what

inclination of the dihedral with the horizontal

line will the edge be invisible?

21. A point source of light of luminous

intensity P=100 cd is placed at a distance

$u = 20$cm from the pole of a concave mirror

of focal length f=2 cm. Find the luminous

intensity of the reflectance on the mirrior is

$\rho = 0.80$