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EE255

a $\mathcal{E} = \pi L = \pi/2$

$L = \mathcal{E}/\pi$

$L = \mathcal{E}/\pi \times$ reflection factor

$L = \frac{44,000}{\pi} \times \frac{85}{100} = 11.905 \times 10^3 \text{ cd/m}^2$

ii) $L = \frac{0.22}{\pi} \times \frac{85}{100}$

$= 59.52 \times 10^{-3} \text{ cd/m}^2$

b $\Phi = I \times \omega = 120 \times 4\pi$

flux emitted by globe (30% is absorbed)

$120 \times 4\pi \times \frac{30}{100} = 144\pi$

Flux emitted by globe

$120 \times 4\pi - 144\pi = 336\pi$ lum

Luminance $= \frac{\text{flux emitted}}{\text{area}} = \frac{336\pi}{\pi \times 0.22^2} = 6942 \text{ lm/m}^2$

11) Candle Power $CP = \frac{\text{lumen}}{w} = \frac{336\pi}{4\pi} = 84 \text{ cd}$

c $Mc\Delta\theta$ = heat required

M = ~~density~~ density $\times v$

$M = 0.55 \text{ g/cm}^3 \times (75 \times 2)\ \text{cm}^3$

$= 82.5 \text{ g}$

$C = \frac{\varepsilon_0 \varepsilon_r A}{t}$

$= \frac{8.85 \times 10^{-12} \times 6.5 \times 75 \times 10^{-4}}{2 \times 10^{-2}}$

$= 21.57 \times 10^{-12} \text{ F}$

$w = 2\pi f = 2\pi \times 20 \times 10^6$

$= 125.664 \times 10^6 \text{ rad/s}$

$P.F = \cos\phi = 0.04$

$\phi = 87.7$

$\delta = 90 - \phi = 90 - 87.7 = 23°$

heat required $= mc\Delta\theta$

$= 82.5 \times 0.255 \times (80-30)$

$82.5 \times 0.255 \times 50$

$= 1051.88$ cal

Heat required: $1051.88 \times 85/100 = 894.098$ cal.

$1_{cal} = 4186 (w.s) J$

$894.096 = x$

Power input $= 894.098 \times 4.186 = 3742.7 (v-s)$

$P = \frac{\text{Energy}}{T}$

$= \frac{3742.7}{8 \times 60} = 7.797 W$

$P_0 = V^2 W_c \tan\delta$

$$\frac{7.797}{125.664 \times 10^6 \times 21.57 \times 10^{-12} \times \tan 2.3} = V^2$$

$V = 267.62 V$

$P = I V \cos\phi$

$I = \frac{7.797}{267.62 \times 0.04}$

$= 0.7284 A$