

$$C = \frac{\epsilon_0 \epsilon_r A}{l} = \frac{8.85 \times 10^{-12} \times 6.5 \times 75 \times 10^{-4}}{2 \times 10^{-2}}$$

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

$$W = 2\pi f = 2 \times \frac{2\pi}{4} \times 20 \times 10^6$$

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

$$\text{PF} = \cos \phi = 0.104$$

$$\phi = \cos^{-1}(0.104) = 87.7$$

$$= 90 - \phi = 90 - 87.7$$

$$= 2.3^\circ$$

$$\text{Heat required} = m C \Delta \theta$$

$$= 82.5 \times 0.255 \times (60 - 30)$$

$$= 1051.9 \text{ cal}$$

$$\text{Total heat required} = \frac{1051.9 \times 85}{100}$$

$$= 894.1 \text{ cal}$$

$$1 \text{ cal} = 4.186 \text{ (W.s)}^5$$

$$894.1 = x$$

$$\text{Power input} = 894.1 \times 4.186$$

$$= 3742.7 \text{ (W.s)}$$

$$P = \frac{\text{Energy}}{\text{time}} = \frac{3742.7}{8 \times 60} = 7.8 \text{ W}$$

$$P_d = V^2 W C \tan \delta$$

$$7.8 = V^2 \times 125.664 \times 10^6 \times 21.57 \times 10^{-12} \times \tan 2.3$$

$$7.8 = V^2 \times 1.08866 \times 10^{-4}$$

$$V = \sqrt{\frac{7.8}{1.08866 \times 10^{-4}}} = 267.62 \text{ V}$$

$$P = I V \cos \phi$$

$$I = \frac{7.8}{267.62 \times 0.104} = 0.7286 \text{ A}$$

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15/ENW04/052

EEE 552 Assignment

A.

$$E = \bar{n}L$$

$$L = \frac{E}{\bar{n}}$$

$$L = \frac{E}{\bar{n}} \times \text{reflection factor}$$

$$\therefore L = \frac{44,000}{\pi} \times \frac{85}{100}$$

$$= 11904.7$$

$$= 11,905 \times 10^3 \text{ cd/m}^2$$

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

$$= 0.05952$$

$$= 59.5 \times 10^{-3} \text{ cd/m}^2$$

B. Flux emitted

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

Flux emitted by globe

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

$$\therefore \text{Flux emitted} = 120 \times 4\pi - 144\pi$$

$$= 480\pi - 144\pi = 336\pi$$

$$\text{Luminance} = \frac{\text{Flux emitted}}{\text{area}} = \frac{336\pi}{0.22^2 \times \pi}$$

$$= 6942.1 \text{ lm/m}^2$$

$$\text{Candle power} = \frac{\text{lumen}}{\omega} = \frac{336\pi}{4\pi}$$

C.

$$\text{Heat required} = mc \Delta \theta$$

$$\text{Density} = \frac{m}{V} \quad m = 0.95 \text{ g/cm}^3 \times (7.5 \times 2) \text{ cm}^3$$

$$= 14.25 \text{ g}$$