

Form A: 2. D 3. B 4. F 5. A 6. B 7. B 8. B 9. D

Form B: 2. F 3. A 4. B 5. B 6. B 7. D 8. D 9. B

Form C: 2. B 3. B 4. B 5. D 6. D 7. B 8. F 9. A

Form D: 2. B 3. D 4. D 5. B 6. F 7. A 8. B 9. B

10. Translate $V_0 = 110V$ $f = 60\text{Hz}$ $R = 6.00\Omega$

$$C = 300\mu\text{F} = 3.00 \times 10^{-4}\text{F} \quad L = 1.00\text{mH} = 1.00 \times 10^{-3}\text{H}$$

$$\text{Equate } Z = \sqrt{R^2 + (X_L - X_C)^2} = \sqrt{R^2 + (\omega L - 1/\omega C)^2}$$

$$Z = \sqrt{R^2 + (2\pi f L - 1/2\pi f C)^2} \quad V = IZ$$

$$\text{Solve } I = V/Z = V / \sqrt{\quad}$$

$$I = \frac{(110)}{((6)^2 + ((2\pi)(60)(10^{-3}) - 1/(2\pi)(60)(3 \times 10^{-4}))^2)^{1/2}}$$

$$I = \frac{(110)}{(36 + (0.377 - 8.842)^2)^{1/2}} = \underline{10.6\text{A}}$$

11. (A) Step-up because the voltage increases.(B) Translate $V = 20,000V$ $I = 10.0A$ $P = ?$

Equate $P = IV$

Solve $P = (10)(20000) = \underline{200,000\text{W}}$

(C) Translate above and $R = 0.6\Omega$, % lost = ?

Equate $P(\text{lost}) = IV$ $V = IR$

Solve % lost = $\frac{P(\text{lost})}{P} = \frac{I(IR)}{P} = \frac{I^2 R}{P}$

$$\% \text{ lost} = \frac{(10)^2(0.6)}{(200000)} = 3.00 \times 10^{-4} = \underline{0.0300\%}$$

12. Translate $h = 2.20 \text{ m}$ $n_1 = 1.333$ $n_2 = 1.000$
 $R = ?$



Equate $\theta_c = \sin^{-1}(n_2/n_1)$ $\tan \theta_c = \frac{\text{opp}}{\text{adj}} = \frac{R}{h}$

Solve $R = h \tan \theta_c = h \tan(\sin^{-1}(n_2/n_1))$

$R = (2.2) \tan(\sin^{-1}(1/1.333)) = \underline{2.50 \text{ meters}}$

13. Translate air = 1 core = 2 cladding = 3
 $n_1 = 1.000$ $n_2 = 1.667$ $n_3 = 1.523$ $\theta = ?$

Equate $n_1 \sin \theta_1 = n_2 \sin \theta_2$ $\theta_c = \sin^{-1}(n_3/n_2)$

Solve $n_1 \sin \theta = n_2 \sin \theta_2$

$\theta_2 + \theta_c + 90^\circ = 180^\circ$ $\theta_2 = 90^\circ - \theta_c$

$\sin \theta = n_2 \sin(90^\circ - \theta_c) = n_2 \sin(90^\circ - \sin^{-1}(n_3/n_2))$

$\theta = \sin^{-1} [n_2 \sin(90^\circ - \sin^{-1}(n_3/n_2))]$

$\theta = \sin^{-1} [(1.667) \sin(90^\circ - \sin^{-1}(1.523/1.667))]$

$\theta = 42.7^\circ$