19.10: Alternating-Current Circuits (Answers)

Check Your Understanding

15.1. 10 ms

15.2. a. *[Math Processing Error]*;

b. *[Math Processing Error]*;

c. *[Math Processing Error]*

15.3. *[Math Processing Error]*

15.4. *[Math Processing Error]*

15.5. 2.00 V; 10.01 V; 8.01 V

15.6. a. 160 Hz;

b. *[Math Processing Error]*;

c. *[Math Processing Error]*;

d. 0.023 rad

15.7. a. halved;

b. halved;

c. same

15.8. *[Math Processing Error]*

15.9. a. 12:1;

b. 0.042 A;

c. *[Math Processing Error]*

Conceptual Questions

1. Angular frequency is *[Math Processing Error]* times frequency.

3. yes for both

5. The instantaneous power is the power at a given instant. The average power is the power averaged over a cycle or number of cycles.

7. The instantaneous power can be negative, but the power output can’t be negative.

9. There is less thermal loss if the transmission lines operate at low currents and high voltages.

11. The adapter has a step-down transformer to have a lower voltage and possibly higher current at which the device can operate.

13. so each loop can experience the same changing magnetic flux

Problems

15. a. *[Math Processing Error]*;

b. *[Math Processing Error]*;

c. *[Math Processing Error]*

17. a. *[Math Processing Error]*;

b. *[Math Processing Error]*;

c. *[Math Processing Error]*

19. 360 Hz

21. *[Math Processing Error]*

23. a. *[Math Processing Error]*;

b. *[Math Processing Error]*

25. a. *[Math Processing Error]*;

b. 0.16 A;

c. *[Math Processing Error]*;

d. *[Math Processing Error]*

27. a. *[Math Processing Error]*;

b. 0.15 A;

c. *[Math Processing Error]*;

d. *[Math Processing Error]*, 0.092 A, *[Math Processing Error]*

29. a. *[Math Processing Error]*;

b. *[Math Processing Error]*;

c. *[Math Processing Error]*

31. a. 0.89 A;

b. 5.6A;

c. 1.4 A

33. a. 5.3 W;

b. 2.1 W

35. a. inductor;

b. *[Math Processing Error]*

37. *[Math Processing Error]*

39. a. 820 Hz;

b. 7.8

41. a. 50 Hz;

b. 50 W;

c. 13;

d. 25 rad/s

43. The reactance of the capacitor is larger than the reactance of the inductor because the current leads the voltage. The power usage is 30 W.

45. a. 45:1;

b. 0.68 A, 0.015 A;

c. *[Math Processing Error]*

47. a. 41 turns;

b. 40.9 mA

Additional Problems

49. a. *[Math Processing Error]*;

b. *[Math Processing Error]*;

c. *[Math Processing Error]*

51. a. *[Math Processing Error]*;

b. *[Math Processing Error]*

53. a. 19 A;

b. inductor leads by *[Math Processing Error]*

55. *[Math Processing Error]*

57. 36 W

59. a. *[Math Processing Error]*;

b. *[Math Processing Error]*

Challenge Problems

61. a. 335 MV;

b. the result is way too high, well beyond the breakdown voltage of air over reasonable distances;

c. the input voltage is too high

63. a. *[Math Processing Error]*;

b. 0.5 A;

c. *[Math Processing Error]*, lagging;

d. *[Math Processing Error]*;

e. 0.995;

f. 6.25 J

65. a. *[Math Processing Error]*;

b. *[Math Processing Error]*;

c. *[Math Processing Error]*;

d. *[Math Processing Error]*;

e. *[Math Processing Error]*;

f. *[Math Processing Error]*

67. The units as written for inductive reactance Equation 15.8 are *[Math Processing Error]*H. Radians can be ignored in unit analysis. The Henry can be defined as *[Math Processing Error]*. Combining these together results in a unit of *[Math Processing Error]* for reactance.

69. a. 156 V;

b. 42 V;

c. 154 V

71. a. *[Math Processing Error]* and \(\displaystyle \frac{v_{out}}{v_{in}}=\frac{ωL}{\sqrt{R^2+ω^2L^2}};

b. *[Math Processing Error]* and *[Math Processing Error]*

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