

ELECTRICITY ASSESSMENT

Answer Key

Revised: 04 Mar 2009

1. Which of the wire sizes listed below results in the least voltage drop in a circuit carrying 10 amps:

- a. 16 AWG
- b. 14 AWG
- c. 18 AWG
- d. 250 kcmil (250 MCM)
- e. 4/0 AWG

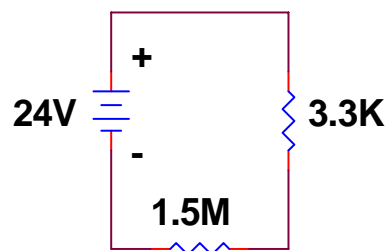


figure 01

2. What is the electric power supplied by the battery shown in figure 01:

- a. 3.83 mW
- b. 38.3 mW
- c. 383 mW
- d. 383 μ W
- e. 3830 μ W

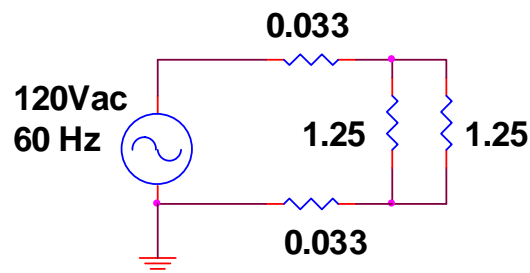
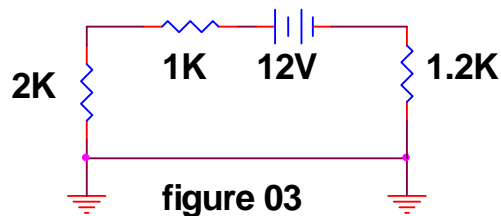


figure 02

3. What is the total power consumed by the four resistors shown in figure 02

- a. 23 kW
- b. 21 kW
- c. 2100 W
- d. 2.9 kW
- e. 290 W



4. The current through the 2K resistor shown in the circuit in figure 03 is:
- 0.7 mA
 - 1.4 mA
 - 2.9 mA
 - 5.7 mA
 - 11.4 mA
5. A schematic shows five (5) identical resistors connected in parallel across a 230 Vac source as an anti-condensation heater for a large motor. The instruction manual states that the entire anti-condensation heater circuit requires 350 watts. What should be the value of each of the resistors:
- 30 ohms
 - 151 ohms
 - 327 ohms
 - 755 ohms
 - 1510 ohms
6. Circuit breaker 1L3-12 in 120 V lighting panel 1L3 feeds the paint locker. The current measures 8.5 amps using a clamp-on ammeter. The number of 100 watt bulbs on this circuit is most likely:
- 4
 - 6
 - 8
 - 10
 - 12
7. Three heating elements are connected in a delta configuration to a three-phase power system to provide galley hot water. The current in each element is measured to be 15 amps. What is the expected line current for each phase:
- 15 amps
 - 26 amps
 - 21.2 amps
 - 30 amps
 - 45 amps
8. A very distorted sine wave voltage from an adjustable speed drive (ASD) shows three complete cycles on an oscilloscope trace in a time of 75 msec. The frequency of this signal is most likely:
- 13 Hz
 - 4.4 Hz
 - 40 Hz
 - 50 Hz
 - 60 Hz

9. An oscilloscope is used to measure the value of an AC power-line voltage waveform. The peak-to-peak voltage measured is 680 volts. The RMS value of this voltage is:
- 120 volts
 - 240 volts
 - 208 volts
 - 440 volts
 - 480 volts

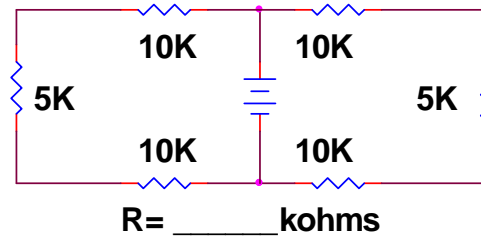


figure 04

10. In the circuit shown in figure 04, the effective load seen by the battery is:
- 25 kohms
 - 50 kohms
 - 5 kohms
 - 2.5 kohms
 - none of the above

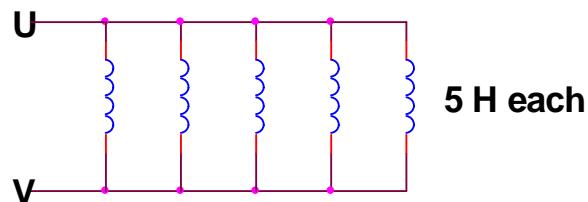


figure 05

11. Each of the inductors shown in figure 05 has a 5 H value, what is the effective total inductance:
- 0.2 H
 - 1 H
 - 5 H
 - 25 H
 - none of the above
12. What is the peak positive voltage, with respect to the neutral conductor, on a 3-phase 208/120 power system operating at 60 Hz:
- 120 Vac
 - 208 Vac
 - 120 X 1.414
 - 120 X 1.732
 - 208 X 1.414

13. An SOV has a coil rating of 120 Vdc, 35 W. An ohmmeter is used to check the coil resistance. The value should be:

- a. about 410 ohms
- b. about 3.4 ohms
- c. much less than 410 ohms; due to inductive reactance
- d. much greater than 410 ohms; due to inductive reactance
- e. the coil is DC and has no resistance

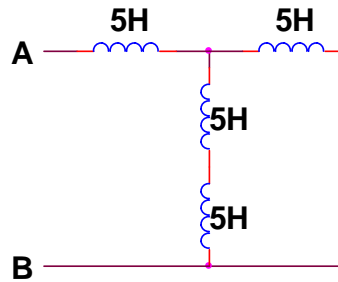


figure 06

14. The effective inductance exhibited by the circuit shown in figure 06 is:

- a. 3.8 H
- b. 8.3 H
- c. 6.5 H
- d. 20 H
- e. 5.7 H

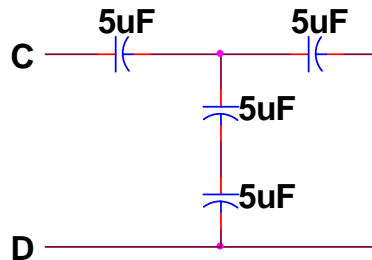


figure 07

15. The total effective capacitance exhibited by the circuit shown in figure 07 is:

- a. 7.5 uF
- b. 0.133 uF
- c. 0.2 uF
- d. 3.0 uF
- e. 2.5 uF

16. If an 8 μF capacitor, rated at 660 Vac is placed directly across a 230 Vac 50 Hz circuit, the resulting current through the circuit is:
- a. 3.98 amps
 - b. 0.58 amps**
 - c. 1.15 amps
 - d. 1.99 amps
 - e. 1.65 amps
17. A 10 AWG copper conductor has a resistance of 1.0 ohms per 1000 feet. A single phase circuit is run from the Bridge to the Engine-room (500 feet). What would be the voltage drop caused across both copper conductors if the load is 1200 watts at 120 volts:
- a. 0 volts
 - b. 10 volts**
 - c. 12 volts
 - d. 18 volts
 - e. 36 volts

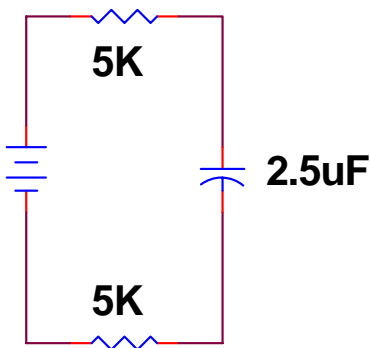


figure 08

18. The time constant of the circuit shown in figure 08 is:
- a. 25 sec
 - b. 12.5 usec
 - c. 0.025 sec**
 - d. 0.25 sec
 - e. cannot be determined until the applied voltage is known

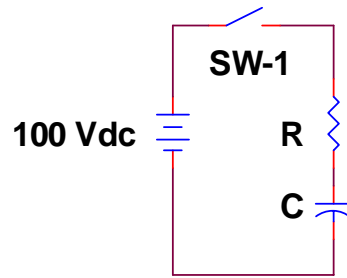


figure 09

19. For the circuit shown in figure 09, after SW-1 is closed the voltage across the capacitor after one time constant has passed is:

- a. 63 volts
- b. 37 volts
- c. 100 volts
- d. 0 volts
- e. cannot be determined without resistor and capacitor values

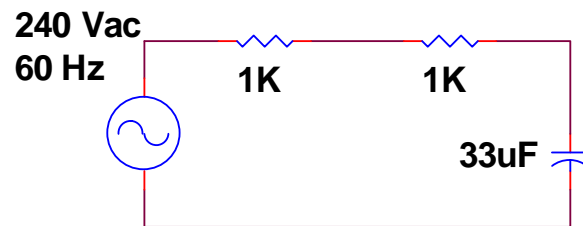


figure 10

20. What is the reactance/resistance/impedance (read carefully) of the circuit shown in figure 10:

- a. 80/2000/2002 ohms
- b. 80/2000/80 ohms
- c. 40/2000/80 ohms
- d. 40/1000/1001 ohms
- e. 80/2000/500 ohms

21. If the voltage leads the current by 30 degrees, the power factor is:

- a. 0.86 lagging
- b. 0.86 leading
- c. 0.5 lagging
- d. 0.5 leading
- e. none of the above

22. A three phase transformer bank is composed of three single-phase transformers having a primary voltage of 4800 Vac and a secondary voltage of 2400 Vac. If the transformers are connected wye-delta to a 4160 Vac source, the line-to-line voltage on the secondary is:

- a. 2400 Vac
- b. 4160 Vac
- c. 1390 Vac
- d. 1200 Vac
- e. 3600 Vac

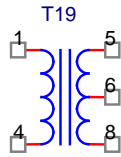


figure 12

23. What is the approximate efficiency of the transformer shown in figure 12, if the input voltage is 230 Vac, the input current is 27.4 amps, the output voltage is 230 Vac, and the output current is 25.8 amps:

- a. 100%
- b. 98%
- c. 96%
- d. 94%
- e. 92%



figure 13

24. The current in the circuit shown in figure 13 is (look carefully):

- a. 0.25 amps
- b. 0.5 amps
- c. 0.24 amps
- d. 0.48 amps
- e. 0.0 amps

25. A skid-mounted portable generator has a nameplate rating of: 480 Vac, 3-phase, 60 Hz, 50 kW, 0.8 pf, wye connected. What two voltage levels is the machine capable of delivering:

- a. 480 Vac and 240 Vac
- b. 480 Vac and 120 Vac
- c. 480 Vac and 277 Vac
- d. 240 Vac and 240 Vac
- e. 277 Vac and 240 Vac

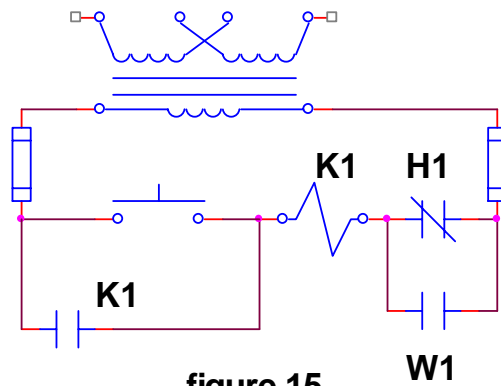


figure 15

26. For the circuit shown in figure 15, K1 is de-energized when:

- H1 is de-energized and W1 is de-energized
- H1 is de-energized and W1 is energized
- H1 is energized and W1 is de-energized**
- H1 is energized and W1 is energized
- both answers c. and d. are correct

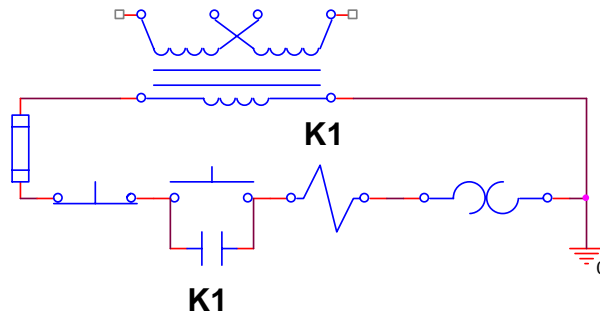


figure 16

27. In the circuit of figure 16, what voltages are measured across the N.O. pushbutton switch and the overload device if the overload device and the N.O. switch are both open:

- 120Vac / 120Vac
- 120Vac / 0Vac
- 0Vac / 120Vac
- 0Vac / 0Vac**
- 60Vac / 60Vac

28. An induction motor is listed as having a slip of 3% at full load. Using a tachometer, a four pole machine at 60 Hz indicates a rpm of 1725. What is the % slip and is the motor being overloaded?

- 4.2% slip; not overloaded
- 4.2% slip; overloaded**
- 0.96% slip; not overloaded
- 9.6% slip; overloaded
- 3.0% slip; not overloaded

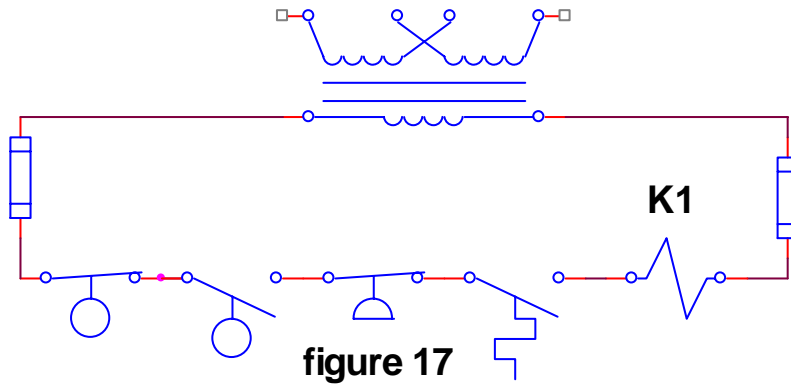


figure 17

29. For the circuit shown in figure 17, for coil K1 to be energized, the following conditions have to be true:

- a. level low, level high, pressure low, temperature low
- b. level low, level high, pressure low, temperature high**
- c. level low, level high, pressure high, temperature low
- d. level low, level high, pressure high, temperature high
- e. the coil will never energized because level switches are wired incorrectly

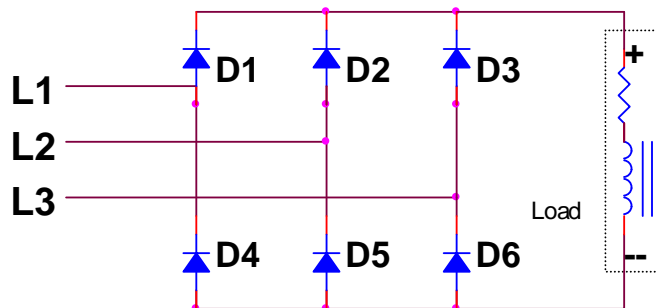


figure 18

30. The circuit shown in figure 18 is:

- a. a single phase full-wave rectifier with spare circuit diodes
- b. a single phase half-wave rectifier with parallel diodes
- c. a three phase half wave rectifier with parallel diodes
- d. a complete three phase full wave uncontrolled rectifier**
- e. a three phase full wave rectifier with redundant diodes

31. The term CCA (cold cranking amps), as applied to a battery rating, has the same meaning as:

- a. maximum cell voltage
- b. amp-hr capacity
- c. guaranteed service life
- d. power factor
- e. none of the above**

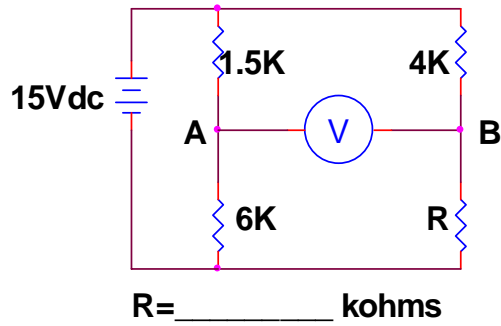


figure 19

32. What value of resistance R will make the potential difference between points A and B zero in the circuit in figure 19?

- a. 120 Ω
- b. 6000 Ω
- c. 1500 Ω
- d. 4000 Ω
- e. 16000 Ω

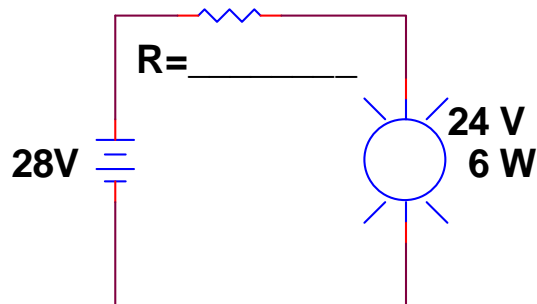


figure 20

33. In the circuit shown in figure 20, the lamp is rated at 24 Vdc 6 W. The supply voltage is 28 Vdc and the lamp burns out too quickly. Compute the value of resistance needed to drop the voltage across the lamp to its 24 Vdc value

- a. 250 Ω
- b. 19 Ω
- c. 16 Ω
- d. 16 k Ω
- e. 96 Ω

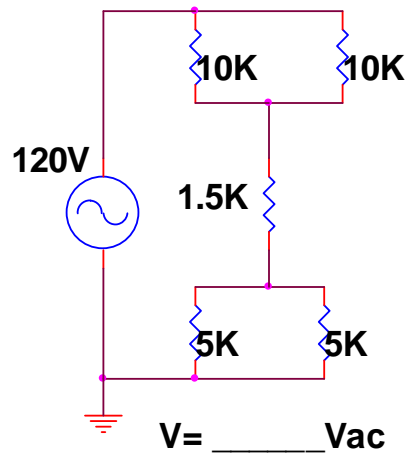
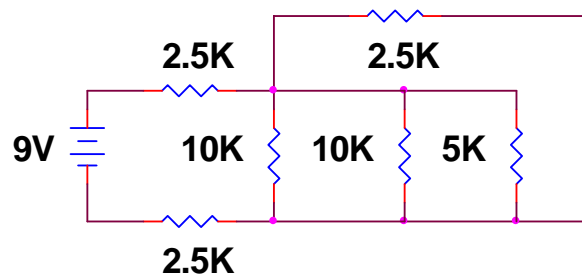


figure 21

34. For the circuit shown in figure 21, calculate the voltage drop across the upper two resistors.

- a. 120 V
- b. 67 V
- c. 80 V
- d. 74 V
- e. Cannot be Determined



R= _____ kohms

figure 22

35. What is the effective value of the resistors shown in the circuit in figure 22?

- a. 10000 Ω
- b. 1875 Ω
- c. 1275 Ω
- d. 6250 Ω
- e. 15000 Ω