

Spring Test 3 due 04/19/2013

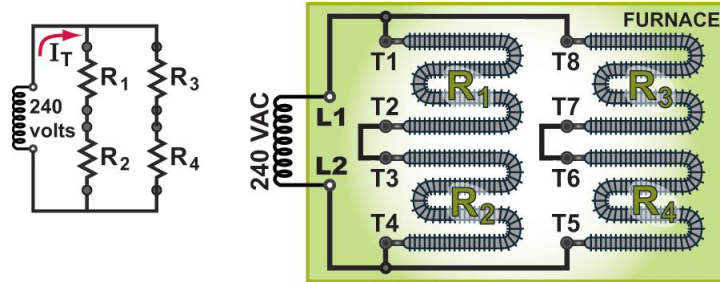
Multiple Choice

Identify the choice that best completes the statement or answers the question.

- ___ 1. What minimum size conductor is required for a 15 KW, single-phase, 120/240V generator?
 a. #8 b. #4 c. #2 d. 1/0
- ___ 2. What is the individual conductor current-carrying capacity when twelve 12 AWG THHN/THWN copper conductors are installed in a raceway?
 a. 30 amperes b. 20 amperes c. 21 amperes d. 15 amperes

Figure 129.104

Both the schematic (near right) and the pictorial drawing (far right) are shown. The fixed resistance of EACH of the four elements in the furnace is 40 ohms.



- ___ 3. Refer to Figure 129.104. When connected to the circuit, the total current drawn by the furnace (all four heating elements together) is ___ amps.
 a. 48 b. 6 c. 12 d. 24 e. 40
- ___ 4. A 20-amp circuit breaker opens very quickly (within 1 second) when subjected to ____.
 I. a ground fault of 250 amps
 II. an overload of 23 amps
 III. a short circuit of 450 amps
 a. I or II only b. I or III only c. II or III only d. I, II, or III



Figure 132.101

- ___ 5. The disconnect switch shown in Figure 132.101 is fused with plug fuses and supplied from a 2-pole breaker in space 1-3 in the 120/240-volt, 3Ø, 4-wire panel. This ___ a Code violation.
 a. is not b. is

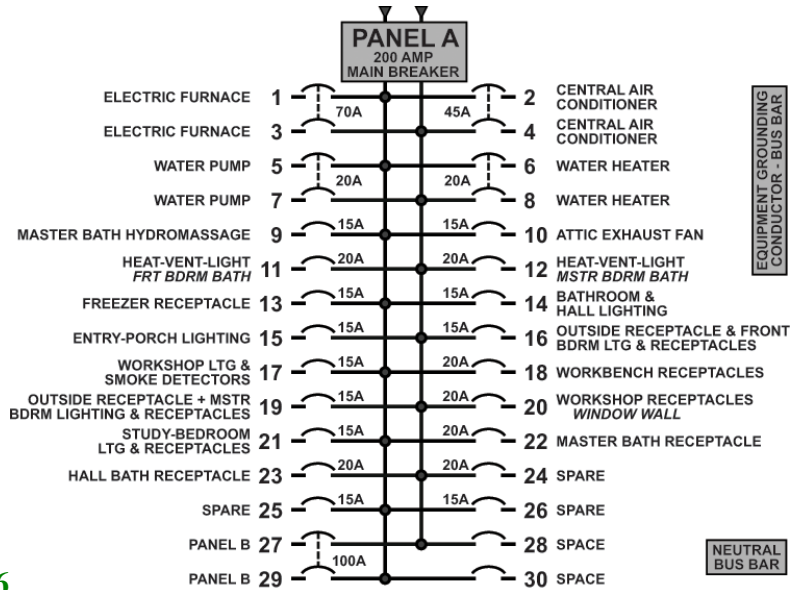


Figure 130.106

6. Refer to Figure 130.106. How many 1-pole, 15-amp circuit breakers are contained in Panel A?
- a. 11 b. 9 c. 10 d. 7

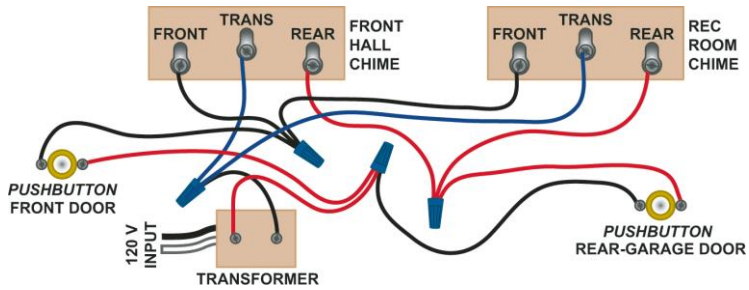
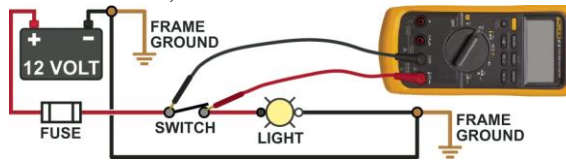


Figure 126.127

7. The two chimes shown in Figure 126.127 are connected in ____.
- a. series b. parallel
8. The green bonding screw that is shipped with and installed in a 120/240-volt, single-phase circuit-breaker panel connects (bonds) the ____ to the metal panel enclosure.
- I. branch-circuit neutrals II. branch-circuit "hots"
- a. both I & II b. I only c. II only d. neither I nor II
9. It ____ permitted to install Class 2 wiring in the same raceway or enclosure as electric light and power wiring.
- a. is b. is not

10. With the switch in the position shown below, the voltmeter will indicate a reading of ____ volts.



- a. 120 b. 0 c. 24 d. 12
11. In general, underwater swimming pool lighting fixtures should be positioned so that the top of the fixture lens is at least ____ inches below the normal water level.

- a. 12 b. 18 c. 24 d. 36

Figure 130.104

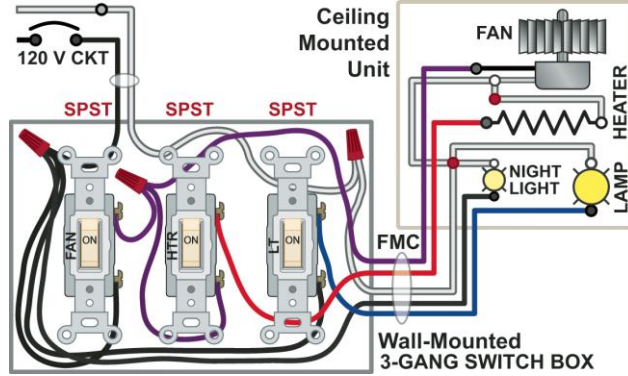
1	spare	4.8 KW load	2	Panel LC Schedule 120/240 V 1Ø, 3-wire The spare breaker in space #1 is connected to AØ.
3	spare	5.4 KW load	4	
5	spare		6	
7	spare	spare	8	
9	9.82 KW load	spare	10	
11		spare	12	
13	6.32 KW load	11.7 KW load	14	

- ___ 12. Refer to Figure 130.104. Circuit 2 will draw ___ amps.
a. 25 b. 40 c. 32 d. 20 e. 4.8
- ___ 13. Receptacles within ___ of the inside wall of a pool must be GFCI protected.
a. 20' b. 5' c. 10' d. 1'
- ___ 14. When a ground fault occurs, the OCPD will trip very quickly if the fault current has a low resistance path (ground return path) to take through the equipment grounding conductor. The lower this resistance, the faster the OCPD opens. Which of these ground return paths has the least (or lowest) resistance where run between two metal boxes? The copper grounding conductor is bonded (or connected) to each box.
a. the 12 AWG copper equipment grounding conductor inside PVC
b. a 3/4" EMT with a 12 AWG copper equipment grounding conductor
c. both a & b have equal resistance
- ___ 15. As used in NEC® Table 300.5, ___ is defined as the shortest distance in millimeters (inches) measured between a point on the top surface of any direct-buried conductor, cable, conduit, or other raceway and the top surface of finished grade, concrete, or similar cover.
a. rise b. backfill c. depth d. cover
- ___ 16. For temporary installations, the NEC® requires that receptacles be ____.
a. made of thermoplastic c. of the grounding type
b. protected at not less than 30 amperes d. all of these

Complete the following verbatim Code statements or provide the NEC® reference.

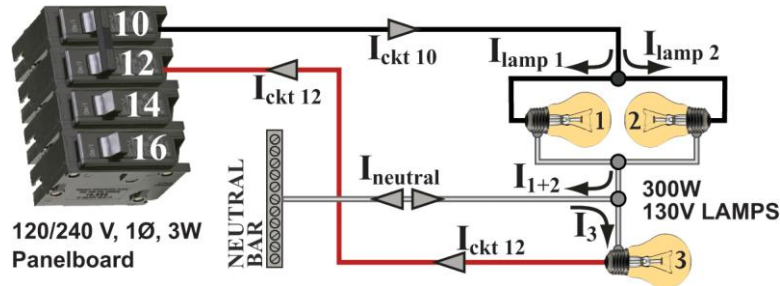
- ___ 17. NEC® Section ___ states the following. *Conductors of dissimilar metals shall not be intermixed in a terminal or splicing connector where physical contact occurs between dissimilar conductors (such as copper and aluminum, copper and copper-clad aluminum, or aluminum and copper-clad aluminum), unless the device is identified for the purpose and conditions of use.*
a. 210.52 b. 422.10 c. 310.15 d. 110.14
- ___ 18. Article ___ of the NEC® is the article that gives requirements for swimming pool installations.
a. 560 b. 680 c. 750 d. 860

Figure 124.109



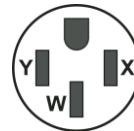
- ___ 19. Refer to the switch diagram shown in Figure 124.109. The FAN can be turned ON only when the LAMP is ON.
- a. True
 - b. False

Figure 128.201



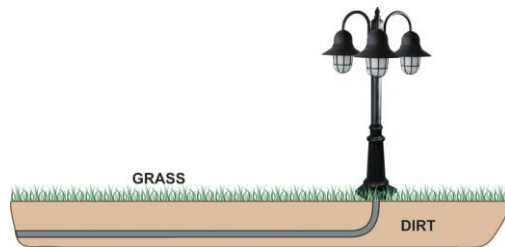
- ___ 20. Refer to Figure 128.201. What is the voltage across Lamp 2?
- a. 240
 - b. 0
 - c. 120
 - d. 480
- ___ 21. A *Signaling Circuit* is defined in ___ in the NEC®.
- a. 800.3(B)(2)
 - b. 725.10(C)
 - c. Article 100
 - d. 725.1

Figure 123.37



- ___ 22. Refer to Figure 123.37. A grounded conductor should be connected to the ___ terminal on this receptacle.
- a. w
 - b. x
 - c. y
 - d. x or y
 - e.

Figure 121.212

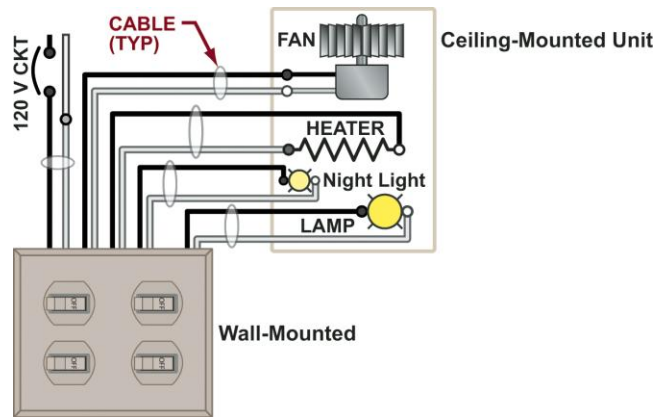


- ___ 23. A post light is located in the front yard of a house as shown in Figure 121.212. Schedule 40 PVC will be installed under the yard to get power to the 120-volt light. In inches, what is the minimum depth from the top of the conduit to the top of the dirt in the yard?

- a. 6 b. 24 c. 18 d. 12 e. 4

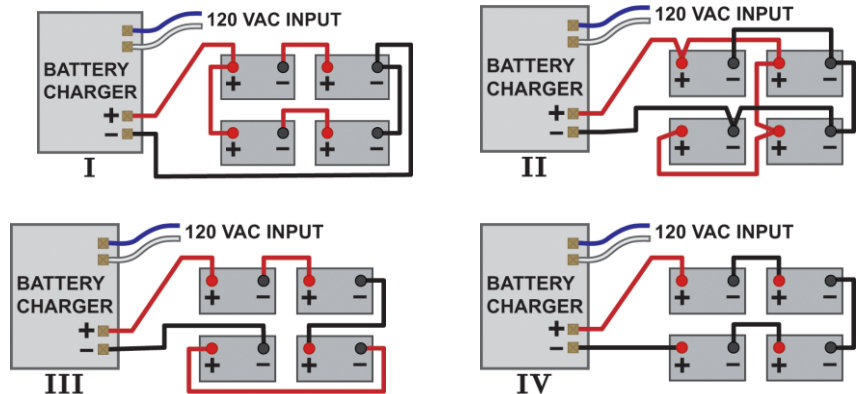
24. When a load calculation results in an ampere rating that does not match the ampacity of the conductor, which of the following is permitted?
- Select an OCPD rated at not more than twice the ampacity of the conductor.
 - Select an OCPD of the next higher standard ampere rating.
 - Select an OCPD rated at not more than 125% of the ampacity of the conductor.
25. How much current does a 6,000 volt-ampere, 240-volt clothes dryer draw?
- 50 amperes
 - 40 amperes
 - 25 amperes
 - 30 amperes
26. On circuits supplying cord-and-plug-connected air conditioners, the branch-circuit overcurrent protective device rating is not permitted to exceed ____.
- the ampacity of the branch-circuit conductors
 - the rating of the receptacle to which the air conditioner is connected
 - 50 percent of the total load of the air conditioner plus other loads on the same circuit
 - either a or b, whichever is less

Figure 124.106



27. How many 12-2 cables enter the wall-mounted switch box shown in Figure 124.106?
- 5
 - 3
 - 2
 - 4
 - none of these

Figure 128.525



28. Which of the diagrams shown in Figure 128.525 shows a 24-volt charger correctly connected to the batteries? Each battery is rated for 12 volts.
- III
 - I
 - II
 - IV
 - none of these

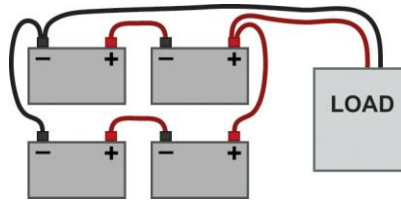


Figure 128.523

- ___ 29. Refer to Figure 128.523. Each battery puts out 6 volts. The voltage applied to the load is ___ volts.
 a. 36 b. 48 c. 12 d. 24 e. 0
- ___ 30. When conduits are installed through an exterior wall, the conduits must be sealed to prevent ____.
 a. the entrance of small insects or animals c. the installation of additional conductors
 b. the exchange of warm air to cooler air
- ___ 31. When calculating the size of the required service, you should consult household cooking equipment demand factors given in Table ____.
 a. 220.56 b. 220.12 c. 220.42 d. 220.55 e. 220.54
- ___ 32. A(n) ___ shall be provided to disconnect each appliance from all ungrounded conductors
 a. operator b. means c. circuit d. terminal
- ___ 33. According to NEC® Article 725, the outputs of two different Class 2 transformers can be connected together ____.
 a. if they have the same VA rating c. if they are listed for interconnection
 b. if they are power limited d. under no condition of use
- ___ 34. When installing any audio/video/data cables, the cable runs should ____.
 a. be secured with rounded or depth-stop staples
 b. be bundled loosely with other cables
 c. not be kinked or knotted
 d. all of these
- ___ 35. Trade size ___ is the minimum size Schedule 80 PVC (rigid polyvinyl chloride conduit) that can contain fourteen each 8 AWG copper THHN/THWN conductors.
 a. 1/2 b. 3/4 c. 1 d. 1 1/4 e. 1 1/2
- ___ 36. According to 240.4(D) in the NEC®, the maximum rating of the overcurrent protection for a 10 AWG copper conductor is ___ amps.
 a. 20 b. 25 c. 30 d. 40
- ___ 37. What special types of conduit fittings are required where connected to metal equipment enclosures? The conduits enter through concentric or eccentric knockouts (KOs) or poorly cut holes. The hole saw used to cut the holes was dull and resulted in elliptical-shaped holes.
 a. set-screw connectors c. bonding bushings
 b. compression (weather tight) connectors d. insulating (plastic) bushings
- ___ 38. The Code section that addresses sensor (automatic) control of lighting in a residential bathroom is _____. *Select N/A (not applicable) if there is not a Code reference for this.*
 a. 210.70(A)(1) Exc 2 c. 210.8(B)(1) e. N/A
 b. 210.8(A)(1) d. 210.70(A)(2)

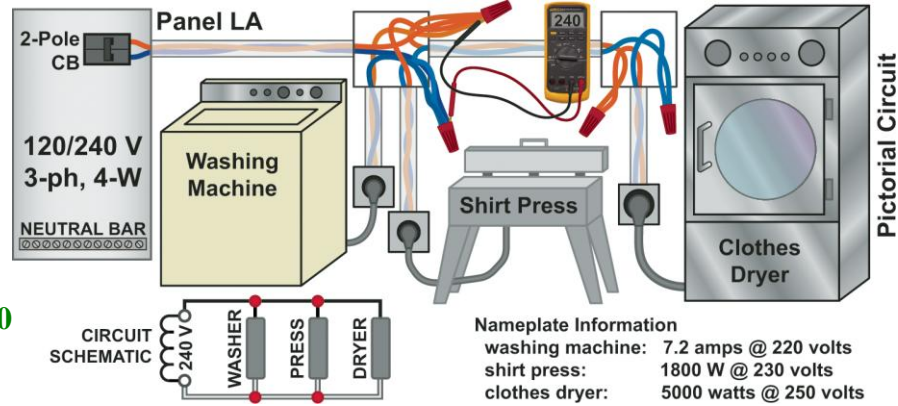


Figure 119.570

39. _____ T) to all three loads.

- a. 8,517 b. 8,661 c. 8,384 d. 8,453 e. 8,109

Figure 119.570 shows an equipment layout in a laundromat. ___ watts of power are consumed by the washing machine (PWM).

- a. 1,800 b. 1,885 c. 1,584 d. 1,728 e. 1,960

For trade size 2 RMC, ___ is the maximum number of #8 THWN/THHN copper conductors that can be installed.

- a. 31 b. 25 c. 41 d. 29 e. 37

What is the minimum trade size FMC required to contain four 250 kcmil THHN/THWN copper conductors?

- a. 2 b. 11^2 c. 3 d. 21^2 e. none of these

When temporary installations operate at over 600 volts, access shall be limited to ___.

- a. authorized personnel d. authorized and qualified personnel
 b. electricians only e. any of these
 c. full-time employees

The grounded conductor of an existing branch circuit is permitted to serve as the equipment grounding conductor for a replacement range or cooktop when which of the following conditions are met?

- a. the grounded conductor is not smaller than 10 AWG copper or 8 AWG aluminum
 b. the individual branch circuit is existing
 c. the grounded conductor is insulated, unless it is part of Type SE cable
 d. all of these

When a Type UF cable is installed under a residential driveway, it is required to be buried at least ___ inches below the top of the driveway.

- a. 6 b. 12 c. 18 d. 24

- 1^2 e. 8

The nameplate on a 1Ø boiler indicates that it can be operated at either 240 or 480 volts. It contains two heating elements. Each element has a rating of 16.2 kW at 240 volts. A boiler is simply a large water heater.

50. _____

a. series

b. parallel



51. _____

a. 

b. 

c. 

d.  or 

e. none of these

The term gigahertz means _____ per second.

a. million cycles

b. million bytes

c. billion cycles

d. billion bytes

Spring Test 3 due 04/19/2013
Answer Section

1. **ANS: B**

____#4

2011 NEC: 445.13; T. 310.15(B)(16)

PTS: 1 REF: 2011 NEC: 445.13; T. 310.15(B)(16)
OBJ: Obj 135.2 Worksheet NAT: Obj 135.2 ABank

2. **ANS: D**

____15

2011 NEC: T. 310.15(B)(3)(a) | 2011 NEC: T. 310.15(B)(16)

PTS: 1 REF: 2011 NEC: T. 310.15(B)(3)(a) | 2011 NEC: T. 310.15(B)(16)
NAT: Obj 129.3 ABank

3. **ANS: B**

$$12 = R_{34} = 80 \Omega \Rightarrow R_T = 40 \Omega \Rightarrow I = E_a \div R_T = 240 \div 40 = 6 \text{ A}$$

PTS: 1 REF: Gen Knowledge OBJ: Obj 129.1 Worksheet
NAT: Obj 129.1 ABank TOP: Current

4. **ANS: B** PTS: 1 REF: Gen Knowledge

NAT: Obj 132.3 ABank

5. **ANS: B**

2011 NEC: 240.50(A)(2)

PTS: 1 REF: 2011 NEC: 240.50(A)(2) OBJ: Obj 132.1 Worksheet
NAT: Obj 132.1 ABank

6. **ANS: A** PTS: 1 REF: Gen Knowledge

NAT: Obj 130.1 ABank

7. **ANS: B** PTS: 1 REF: Gen Knowledge

OBJ: Obj 126.1 Worksheet NAT: Obj 126.1 ABank

8. **ANS: B**

PTS: 1 REF: 2011 NEC: 250.24(B) OBJ: Obj 130.2 Worksheet
NAT: Obj 130.2 ABank

9. **ANS: B**

PTS: 1 REF: 2011 NEC: 725.136(A) NAT: Obj 126.1 ABank

10. **ANS: B** PTS: 1 REF: Open/Closed Sw Meter Reading

OBJ: Obj 122.3 Worksheet NAT: Obj 122.3 ABank

MSC: EPS Dwg: ABank_122.3_Q6

11. **ANS: B**

PTS: 1 REF: 2011 NEC: 680.23(A)(5) OBJ: Obj 134.2 Worksheet
NAT: Obj 134.2 ABank

12. **ANS: B** PTS: 1 REF: Gen Knowledge

OBJ: Obj 130.1 Worksheet NAT: Obj 130.1 ABank

13. **ANS: A**

PTS: 1 REF: 2011 NEC: 680.22(A)(4) OBJ: Obj 134.5 Worksheet
NAT: Obj 134.5 ABank

14. **ANS: B**

PTS: 1 REF: 2011 NEC: 250.4(A)(5) OBJ: Obj 121.1 Worksheet

- NAT: Obj 121.1 ABank
15. ANS: D
- PTS: 1 REF: 2011 NEC: T. 300.5 Note 1 OBJ: Obj 121.2 Worksheet
NAT: Obj 121.2 ABank
16. ANS: C
- PTS: 1 REF: 2011 NEC: 590.4(D) OBJ: 131 NEC Worksheet
NAT: 131 NEC ABank
17. ANS: D
- PTS: 1 REF: 2011 NEC: 110.14 OBJ: 122 NEC Worksheet
NAT: 122 NEC ABank
18. ANS: B
- PTS: 1 REF: 2011 NEC: 680 NAT: Obj 134.1 ABank
ANS: B PTS: 1 REF: Gen Knowledge
NAT: Obj 124.1 ABank
20. ANS: C PTS: 1 REF: Gen Knowledge
NAT: Obj 128.2 ABank TOP: Voltage
21. ANS: C
- PTS: 1 REF: 2011 NEC: 100 NAT: Obj 126.1 ABank
ANS: A PTS: 1 REF: Gen Knowledge
NAT: Obj 123.3 ABank MSC: EPS Dwgs: 123.37a-d
23. ANS: C
- PTS: 1 REF: 2011 NEC: T. 300.5 OBJ: Obj 121.2 Worksheet
NAT: Obj 121.2 ABank
24. ANS: B
- PTS: 1 REF: 2011 NEC: 240.4(B) OBJ: Obj 132.2 Worksheet
NAT: Obj 132.2 ABank
25. ANS: C

$$\dots \div 240 \text{ V} = 25 \text{ A}$$
PTS: 1 REF: Gen Knowledge OBJ: Obj 120.1 Worksheet
NAT: Obj 120.1 ABank
26. ANS: D
- PTS: 1 REF: 2011 NEC: 440.62(A)(4) NAT: Obj 125.4 ABank
ANS: A PTS: 1 REF: Gen Knowledge
OBJ: Obj 124.1 Worksheet NAT: Obj 124.1 ABank
28. ANS: B PTS: 1 REF: Gen Knowledge
OBJ: Obj 128.5 Worksheet NAT: Obj 128.5 ABank
29. ANS: C PTS: 1 REF: Gen Knowledge
OBJ: Obj 128.5 Worksheet NAT: Obj 128.5 ABank
30. ANS: B
- PTS: 1 REF: 2011 NEC: 300.7(A) OBJ: Obj 130.1 Worksheet
NAT: Obj 130.1 ABank
31. ANS: D
- PTS: 1 REF: 2011 NEC: T. 220.55 OBJ: Obj 133.1 Worksheet
NAT: Obj 133.1 ABank
32. ANS: B

PTS: 1 REF: 2011 NEC: 422.30 OBJ: 120 NEC Worksheet
 NAT: 120 NEC ABank
 33. ANS: C

PTS: 1 REF: 2011 NEC: 725.121(B) OBJ: 126 NEC Worksheet
 NAT: 126 NEC ABank
 34. ANS: D PTS: 1 REF: Gen Knowledge
 OBJ: Obj 135.1 Worksheet NAT: Obj 135.1 ABank

35. ANS: E

PTS: 1 REF: 2011 NEC: Anx C: T. C.9 OBJ: Obj 120.1 Worksheet
 NAT: Obj 120.1 ABank TOP: Conduit Fill
 36. ANS: C

PTS: 1 REF: 2011 NEC: 240.4(D)(7) OBJ: 120 NEC Worksheet
 NAT: 120 NEC ABank
 37. ANS: C

PTS: 1 REF: 2011 NEC: 250.90; 250.92(B); 250.96(A)
 OBJ: Obj 130.2 Worksheet NAT: Obj 130.2 ABank
 38. ANS: A

PTS: 1 REF: 2011 NEC: 210.70(A)(1) Exc 2 OBJ: Obj 120.2 Worksheet
 NAT: Obj 120.2 ABank
 39. ANS: D

$$\begin{aligned}
 w_m &= E_{\text{rated}} \div \text{Irated} = 220 \div 7.2 = 30.5556 \, \Omega \Rightarrow l_{w_m} = E_{w_m} \div R_{w_m} = 240 \div 30.5556 = 7.8545 \, \text{A} \\
 P_{w_m} &= [E_{w_m}]_2 \div R_{w_m} = (240)_2 \div 30.5556 = 1,885.0882 \, \text{watts} \\
 R_{s_p} &= [E_{\text{rated}}]_2 \div P_{\text{rated}} = (230)_2 \div 1,800 = 29.3889 \, \Omega \Rightarrow I_{s_p} = E_{s_p} \div R_{s_p} = 240 \div 29.3889 = 8.1663 \, \text{A} \\
 P_{s_p} &= [I_{s_p}]_2 \times R_{s_p} = (8.1663)_2 \times 29.3889 = 1,959.9004 \, \text{watts} \\
 R_{c_d} &= [E_{\text{rated}}]_2 \div P_{\text{rated}} = (250)_2 \div 5,000 = 12.5 \, \Omega \Rightarrow I_{c_d} = E_{c_d} \div R_{c_d} = 240 \div 12.5 = 19.2 \, \text{A} \\
 P_{c_d} &= E_{c_d} \times I_{c_d} = 240 \times 19.2 = 4,608 \, \text{watts} \\
 I_T &= I_{w_m} + I_{s_p} + I_{c_d} = 35.2208 \, \text{A} \quad \text{and} \quad R_T = 1 \div [1/^{30.5556} + 1/^{29.3889} + 1/^{12.5}] = 6.8141 \, \Omega \\
 P_T &= P_{w_m} + P_{s_p} + P_{c_d} = 1,885.0882 + 1,959.9004 + 4,608 = 8,452.9886 \text{ or } 8,453 \, \text{watts} \\
 \text{or } P_T &= [E_a]_2 \div R_T = (240)_2 \div 6.8141 = 8,453.0606 \text{ or } \mathbf{8,453} \, \text{watts}
 \end{aligned}$$

PTS: 1 REF: Gen Knowledge OBJ: Obj 120.3 Worksheet
 NAT: Obj 120.3 ABank TOP: Parallel Circuits
 KEY: Find: PT given NP ratings
 40. ANS: B

$$\begin{aligned}
 w_m &= E_{\text{rated}} \div \text{Irated} = 220 \div 7.2 = 30.5556 \, \Omega \\
 P_{w_m} &= [E_{w_m}]_2 \div R_{w_m} = (240)_2 \div 30.5556 = \mathbf{1,885.0882} \, \text{watts}
 \end{aligned}$$

PTS: 1 REF: Gen Knowledge OBJ: Obj 120.3 Worksheet
 NAT: Obj 120.3 ABank TOP: Parallel Circuits
 KEY: Find: P given NP rating
 41. ANS: E

PTS: 1 REF: 2011 NEC: Anx C: T. C.8 NAT: Obj 129.2 ABank
 TOP: Conduit Fill
 42. ANS: D

PTS: 1 REF: 2011 NEC: Anx C: T. C.3 OBJ: Obj 129.2 Worksheet
 NAT: Obj 129.2 ABank TOP: Conduit Fill
 43. ANS: D

PTS: 1 REF: 2011 NEC: 590.7 OBJ: 131 NEC Worksheet
 NAT: 131 NEC ABank
 44. ANS: A PTS: 1 REF: Gen Knowledge

- OBJ: Obj 125.4 Worksheet NAT: Obj 125.4 ABank
45. ANS: D
- PTS: 1 REF: 2011 NEC: 250.140 Exc OBJ: Obj 123.1 Worksheet
 NAT: Obj 123.1 ABank
46. ANS: C
- PTS: 1 REF: 2011 NEC: T. 300.5 OBJ: Obj 121.2 Worksheet
 NAT: Obj 121.2 ABank
47. ANS: D
- PTS: 1 REF: 2011 NEC: 240.6(A) NAT: Obj 132.2 ABank
48. ANS: C
- PTS: 1 REF: 2011 NEC: 680.43(C) OBJ: Obj 134.3 Worksheet
 NAT: Obj 134.3 ABank
49. ANS: B
- PTS: 1 REF: 2011 NEC: 210.12(A) OBJ: Obj 121.1 Worksheet
 NAT: Obj 121.1 ABank
50. ANS: B PTS: 1 REF: Gen Knowledge
 NAT: Obj 125.3 ABank TOP: Parallel Circuits
51. ANS: B PTS: 1 REF: Gen Knowledge
 OBJ: Obj 123.3 Worksheet NAT: Obj 123.3 ABank
 MSC: EPS Dwgs: 123.35a-c
52. ANS: C PTS: 1 REF: Gen Knowledge
 OBJ: Obj 126.1 Worksheet NAT: Obj 126.1 ABank