Journeyman Electrician 26

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Practice Questions

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1. According to the NEC, what is the definition of a branch circuit?

A. The conductors from the utility transformer to the service entrance
B. The conductors between the meter and the main panel
C. The circuit conductors between the final overcurrent device and the outlets
D. The conductors between two panelboards

2. Per NEC Table 310.16, what is the 60°C ampacity of a 12 AWG copper conductor?

A. 20 A
B. 25 A
C. 30 A
D. 15 A

3. What is the primary purpose of grounding electrical equipment?

A. To increase the efficiency of the electrical system
B. To reduce voltage drop across long runs
C. To provide a low-impedance path for fault current and limit voltage rise on equipment enclosures
D. To balance loads across phases

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4. Which type of AC motor operates at a speed that is always slightly less than synchronous speed?

A. Induction motor
B. Synchronous motor
C. Universal motor
D. Reluctance motor

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5. What is the primary purpose of an overcurrent protective device (OCPD)?

A. To open the circuit when current exceeds a safe level
B. To increase voltage during a fault
C. To measure power consumption
D. To regulate frequency

6. A Class I, Division 1 location is defined as one where ignitable concentrations of flammable gases or vapors:

A. Exist under normal operating conditions
B. Exist only during abnormal operations or equipment failure
C. Are not likely to exist in quantities sufficient to produce an ignitable mixture
D. Exist only in outdoor areas

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7. A circuit has a voltage of 120 V and a resistance of 40 Ω. What is the current flowing through the circuit?

A. 3 A
B. 4800 A
C. 0.33 A
D. 80 A

8. Which conduit type is permitted for direct burial without additional protection?

A. Rigid Polyvinyl Chloride Conduit (PVC Schedule 40)
B. Electrical Metallic Tubing (EMT)
C. Flexible Metal Conduit (FMC)
D. Electrical Nonmetallic Tubing (ENT)

9. According to the NEC (National Electrical Code) guidelines, what is the MINIMUM gauge of the copper equipment grounding conductor required for a 300 ampere electrical circuit?

A. 8 AWG.
B. 6 AWG.
C. 10 AWG.
D. 4 AWG.

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10. Which of the following is a standard branch circuit rating recognized by the NEC?

A. 25 amperes
B. 30 amperes
C. 35 amperes
D. 45 amperes

11. What insulation type is rated for 90°C in both dry and wet locations?

A. THWN
B. THWN-2
C. THW
D. TW

12. Which NEC article primarily covers grounding and bonding requirements?

A. Article 250
B. Article 300
C. Article 310
D. Article 230

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13. The nameplate of a motor shows 'SF 1.15'. What does SF stand for?

A. Service Factor
B. Speed Factor
C. Starting Factor
D. Safety Factor

14. A fuse protects a circuit by:

A. Tripping a magnetic latch when current spikes
B. Reducing voltage across the load
C. Melting a fusible element to interrupt current flow
D. Increasing resistance to limit power

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15. In NEC Article 500, what does a Class II location contain?

A. Flammable gases or vapors
B. Flammable liquids with low flash points
C. Combustible dust
D. Easily ignitable fibers or flyings

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16. Using Ohm's Law, what is the resistance in a circuit where V = 240 V and I = 8 A?

A. 1920 Ω
B. 248 Ω
C. 30 Ω
D. 0.033 Ω

17. EMT (Electrical Metallic Tubing) is also commonly called:

A. Rigid conduit
B. IMC conduit
C. Thin-wall conduit
D. Flex conduit

18. The motor operating at a voltage 10% lower than normal will deliver only _____ % of its normal power.

A. +
B. /
C. +
D. /

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19. What is the maximum rating for a residential general-purpose branch circuit supplying receptacle outlets?

A. 20 amperes
B. 30 amperes
C. 40 amperes
D. 50 amperes

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20. Per NEC Table 310.16, what is the 60°C ampacity of a 10 AWG copper conductor?

A. 25 A
B. 35 A
C. 30 A
D. 40 A

21. The grounded conductor in a standard 120/240 V single-phase system is typically which color?

A. Green
B. White or gray
C. Black
D. Red

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22. What does the term 'FLA' on a motor nameplate represent?

A. Full Line Amperage
B. Full Load Amperes
C. Full Locked Amperes
D. Frequency Load Amps

23. Which type of circuit breaker uses both a bimetallic strip for overloads and an electromagnetic coil for short circuits?

A. Magnetic-only breaker
B. Thermal-magnetic breaker
C. Electronic trip breaker
D. Ground-fault breaker

24. Which NEC article covers Class III hazardous locations involving ignitable fibers?

A. Article 500
B. Article 501
C. Article 502
D. Article 503

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25. If I = 5 A and R = 20 Ω, what is the voltage across the resistor?

A. 4 V
B. 100 V
C. 25 V
D. 0.25 V

26. When a conduit contains three or more conductors, the maximum fill percentage is:

A. 53%
B. 40%
C. 31%
D. 25%

27. Which of the following is the MAXIMUM permissible current in 400 watts, 1 ohm resistor?

A. 40 amperes.
B. 2 amperes.
C. 4 amperes.
D. 20 amperes.

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28. How many small-appliance branch circuits are required by the NEC for kitchen receptacle outlets in a dwelling unit?

A. One 15-ampere circuit
B. One 20-ampere circuit
C. Two 15-ampere circuits
D. At least two 20-ampere circuits

29. Which conductor material requires a larger cross-section than copper for the same ampacity?

A. Silver
B. Gold
C. Copper-clad steel
D. Aluminum

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30. What does the term 'effective ground-fault current path' mean?

A. A path with high resistance to slow fault current
B. A direct connection from equipment to earth via a ground rod only
C. A path that only conducts during normal load operation
D. An intentionally constructed, low-impedance path from a fault point back to the electrical supply source

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Answer Key & Explanations

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1. C — The circuit conductors between the final overcurrent device and the outlets
A branch circuit is defined as the circuit conductors between the final overcurrent device protecting the circuit and the outlet(s). Everything upstream of that last OCPD is considered a feeder or service.

2. A — 20 A
NEC Table 310.16 lists 12 AWG copper at 20 A in the 60°C column, 25 A in the 75°C column, and 30 A in the 90°C column. The 60°C rating governs most residential terminations.

3. C — To provide a low-impedance path for fault current and limit voltage rise on equipment enclosures
Grounding establishes a low-impedance path so fault current flows back to the source, causing the overcurrent device to open and limiting dangerous voltage buildup on equipment enclosures.

4. A — Induction motor
An induction motor's rotor turns slightly slower than the rotating magnetic field (synchronous speed), creating slip. This slip is necessary to induce rotor current and produce torque.

5. A — To open the circuit when current exceeds a safe level
An OCPD (fuse or circuit breaker) opens the circuit when current exceeds its rating, protecting conductors and equipment from damage caused by overloads and short circuits.

6. A — Exist under normal operating conditions
Class I, Division 1 locations are those where ignitable concentrations of flammable gases or vapors can exist under normal operating conditions, or where ignitable concentrations may exist frequently because of repair/maintenance operations.

7. A — 3 A
Ohm's Law: I = V / R = 120 / 40 = 3 A. Current equals voltage divided by resistance.

8. A — Rigid Polyvinyl Chloride Conduit (PVC Schedule 40)
PVC Schedule 40 conduit is listed for direct burial per NEC Article 352. EMT, FMC, and ENT are not rated for direct burial applications.

9. D — 4 AWG.
As per the NEC, for a 300 ampere electrical circuit, the minimum size copper equipment grounding conductor is 4 AWG.

10. B — 30 amperes
The NEC recognizes standard branch circuit ratings of 15, 20, 30, 40, and 50 amperes. 25, 35, and 45 amperes are not standard branch circuit ratings.

11. B — THWN-2
THWN-2 carries a 90°C rating for dry and wet locations. THWN is 75°C wet/90°C dry, THW is 75°C, and TW

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is 60°C.

12. A — Article 250
NEC Article 250 is dedicated entirely to grounding and bonding requirements for electrical systems and equipment.

13. A — Service Factor
SF stands for Service Factor. An SF of 1.15 means the motor can handle 15% more than its rated horsepower on a continuous basis without overheating, provided voltage and frequency are at nameplate values.

14. C — Melting a fusible element to interrupt current flow
A fuse contains a fusible (meltable) element. Excessive current generates enough heat to melt the element, permanently opening the circuit. Unlike a breaker, it must be replaced after operation.

15. C — Combustible dust
Class II locations are those that are hazardous due to the presence of combustible dust. Class I covers flammable gases/vapors, and Class III covers easily ignitable fibers or flyings.

16. C — 30 Ω
R = V / I = 240 / 8 = 30 Ω. Resistance equals voltage divided by current.

17. C — Thin-wall conduit
EMT is nicknamed 'thin-wall' because its wall is thinner than RMC or IMC. The other names refer to entirely different conduit types.

18. D — /
In this specific scenario where the voltage is 10% lower, we can calculate the power delivered by the motor using the formula: \(Power\text{ } delivered = (Voltage\text{ } ratio)^2\) Since the voltage is 10% lower, the voltage ratio is 0.9 (1 - 0.10 = 0.9). Plugging this value into the formula: \(Power\text{ } delivered = (0.9)^2 = 0.81\) Therefore, the motor will deliver only 81% of its normal power when operating at a voltage 10% lower than its normal voltage.

19. A — 20 amperes
Residential general-purpose branch circuits for receptacle outlets are limited to a maximum of 20 amperes. Higher ratings are reserved for specific appliance and large-load circuits.

20. C — 30 A
The 60°C column in NEC Table 310.16 lists 10 AWG copper at 30 A. The 75°C column is 35 A and the 90°C column is 40 A.

21. B — White or gray
NEC 200.6 requires the grounded (neutral) conductor to be identified by white or gray insulation so it is easily distinguished from ungrounded conductors.

22. B — Full Load Amperes
FLA (Full Load Amperes) is the current drawn by the motor when operating at its rated horsepower and voltage. This value is used to size branch-circuit conductors and overcurrent protection.

23. B — Thermal-magnetic breaker
A thermal-magnetic circuit breaker combines a bimetallic strip (responds to sustained overloads via heat) and

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an electromagnetic trip (responds instantly to short-circuit currents), providing dual-mode protection.

24. D — Article 503
NEC Article 503 specifically covers Class III locations, which are those hazardous because of the presence of easily ignitable fibers or flyings such as cotton, rayon, and synthetic textiles.

25. B — 100 V
V = I × R = 5 × 20 = 100 V. Voltage equals current multiplied by resistance.

26. B — 40%
NEC Chapter 9, Table 1 allows 40% fill for three or more conductors. The 53% limit applies to one conductor, and 31% applies to exactly two conductors.

27. D — 20 amperes.
Given that the power (P) is 400 watts and the resistance (R) is 1 ohm, we can calculate the current using the formula: \(Power (P) = Current (I)^2 × Resistance (R)\) Simplifying the formula to solve for current (I): \(I = \sqrt{ \frac{\mathrm{P} }{\mathrm{R}}}\) Substituting the values: \(I = \sqrt{ \frac{\mathrm{400} }{\mathrm{1}}}\) = \(\sqrt{400} \) = 20 amperes

28. D — At least two 20-ampere circuits
NEC 210.11(C)(1) requires at least two 20-ampere small-appliance branch circuits for receptacles in kitchens, pantries, breakfast rooms, dining rooms, and similar areas of dwelling units.

29. D — Aluminum
Aluminum has roughly 1.6 times the resistivity of copper, so aluminum conductors must be approximately two AWG sizes larger than copper to carry equivalent current.

30. D — An intentionally constructed, low-impedance path from a fault point back to the electrical supply source
NEC 250.2 defines an effective ground-fault current path as an intentionally constructed, permanent, low-impedance path designed to carry fault current from the fault point back to the source so the overcurrent device operates.

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