COLLEGE OF AGRICULTURE AND APPLIED SCIENCES

SCHOOL OF APPLIED SCIENCE, TECHNOLOGY, AND EDUCATION

ASSESSMENT PLAN FOR:

APPRENTICE ELECTRICIAN

USU EASTERN CAMPUS

PRICE, UTAH

FALL 2017
Apprentice Electrician

Assessment

PROGRAM DESCRIPTION:

An electrician apprentice is someone who works under a licensed electrician in order to learn the trade through first-hand experience. Most states require aspiring electricians to take a formal course through a trade school or technical college. In some instances, students may become an electrician's apprentice during school as part of their training. The USU Eastern Electrical Apprentice Program will give the student the skills and experience to become a journeyman electrician.

Utah State University Eastern's Electrical Apprenticeship program is designed for students working as apprentice electricians to advance to journeyman electrician. The course of study provides all of the classroom and lab experience necessary to advance from apprentice to journeyman in four years.

All classwork for the program is offered in the evening to allow students to complete their required on-the-job training while also completing the classroom requirements. Students will gain experience in electrical theory, National Electrical Code (NEC), and practical work applications, and all class and lab work is supervised by certified master and journeyman electricians.

To receive a license, the students need to eight (8) courses, each 5-credits in length. The courses are taught in an exact sequence in the fall and spring semesters.

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The program is offered only in the evenings to an enrollment limited by shop space and equipment access. A maximum of 20 students enroll in the program per year. The program is taught by two certificated, master electricians with more than 25-years of industry experience.

A program completer are known as Journeymen Electricians. A program completer can earn an Associates of Applied Science degree if they also complete required General Education courses. Few, very few students pursue that pathways.

All students complete a program regulated by the Utah Division of Occupational and Professional Licensure (DOPL). The DOPL is the state administered program for many professional licenses, such as building inspector, funeral services, nursing, and psychology. USU Eastern does not set the educational standards. USU Eastern meets those standards through a rigid curriculum review process by DOPL every three years.
The educational standards for the Apprentice Electrician program are based upon DOPL policy R156 - Commerce, Occupational and Professional Licensing. Specifically, R156-55b-101 are the rules for Electricians Licensing. This rule is known as the "Electricians Licensing Act Rule".

For the Apprentice Electrician program and R156-55b-101, electrical work includes installation of raceway systems used for any electrical purpose, and installation of field-assembled systems such as ice and snow melting, pipe-tracing, manufactured wiring systems, and the like. Electrical work does not include installation of factory-assembled appliances or machinery that are not part of the premises wiring unless wiring interconnections external to the equipment are required in the field, and does not include cable-type wiring that does not pose a hazard from a shock or fire initiation standpoint as defined by Title 15A, State Construction and Fire Codes Act.

USU Eastern provides an approved Apprentice Electrician program. The program of electrical study is approved by the Utah Board of Regents, Utah System of Technical Colleges Board of Trustees or other out of state program that is deemed substantially equivalent as determined by the Electricians Licensing Board. The program is also approved by the Electricians Licensing Board. The program provides at least 81 hours of classroom instruction time. A student attends a minimum of 72 hours to receive credit for the semester. A competency exam is given to each student at the end of each semester with the exception of the fourth year second semester. A student, to continue to the next semester, is required to achieve a score of 75% or higher on the competency exam. A student who scores below 75% may retake the test one time. USU Eastern students are expected to pass each class with a minimum score of 75%.

In order to earn the DOPL license as a residential journeyman, the following skills and experience are required:

1) Show proper use of test equipment.
2) Calculate requirements/loads for motors and circuit conductors.
3) Demonstrate knowledge and understanding of motor control circuits (including drawings/line or ladder diagrams), various motor control devices, relays and contactors and motor starters.
5) Complete at least 4000 hours in raceways, boxes and fittings, conduit, wireways, cableways and other raceways and associated fittings, and non-metallic sheathed cable
6) Complete at least 800 hours in wire and cable, individual conductors and multiconductor cables
7) Complete at least 400 hours in distribution and utilization equipment including transformers, panel boards, switchboards, control panels, disconnects, motor starters, lighting fixtures, heaters, appliances, motors and other distribution and utilization equipment; and
8) Complete at least 400 hours in specialized work including grounding, wiring of systems for sound, data, communication, alarms, automated systems, generators, batteries and computer equipment.
1. The NEC is ____.  
   (a) intended to be a design manual  
   (b) meant to be used as an instruction guide for untrained persons  
   (c) for the practical safeguarding of persons and property  
   (d) published by the Bureau of Standards.  

2. A ____ is an area that includes a basin with a toilet, urinal, tub, shower, bidet, or similar plumbing fixtures.  
   (a) bath area  
   (b) bathroom  
   (c) rest area  
   (d) none of these  

3. Connected to ground or to a conductive body that extends the ground connection is called “____.”  
   (a) equipment grounding  
   (b) bonded  
   (c) grounded  
   (d) all of these  

4. NFPA 70E—Standard for Electrical Safety in the Workplace, provides information to help determine the electrical safety training requirements expected of a qualified person.  
   (a) True  
   (b) False  

5. Many terminations and equipment are either marked with ____ or have that information included in the product’s installation instructions.  
   (a) an etching tool  
   (b) a removable label  
   (c) a tightening torque  
   (d) the manufacturer’s initials  

6. The continuity of a grounded conductor shall not depend on a connection to a _____.  
   (a) metallic enclosure  
   (b) raceway  
   (c) cable armor  
   (d) all of these  

7. An individual 20A branch circuit can supply a single dwelling unit bathroom for receptacle outlet(s) and other equipment within the same bathroom.  
   (a) True  
   (b) False
8. At least one 125V, 15A or 20A receptacle outlet shall be installed within 18 in. of the top of a show window for each _. _ linear ft, or major fraction thereof, of show-window area measured horizontally at its maximum width.
   (a) 10
   (b) 12
   (c) 18
   (d) 24

9. Overhead feeder conductors installed over roofs shall have a vertical clearance of _. _ ft above the roof surface, unless permitted by an exception.
   (a) 3 ft
   (b) 8 ft
   (c) 12 ft
   (d) 15 ft

10. Overhead service conductors shall have a horizontal clearance of not less than _. _ ft from a pool.
    (a) 8
    (b) 10
    (c) 12
    (d) 14

11. For installations consisting of not more than two 2-wire branch circuits, the service disconnecting means shall have a rating of not less than _. _.
    (a) 15A
    (b) 20A
    (c) 25A
    (d) 30A

12. An 800A fuse rated at 1,000V _. _ on a 250V system.
    (a) shall not be used
    (b) shall be used
    (c) can be used
    (d) none of these

13. The grounding electrode conductor shall be connected to the grounded service conductor at the _. _
    (a) load end of the service drop
    (b) load end of the service lateral
    (c) service disconnecting means
    (d) any of these

14. A ground ring encircling the building or structure can be used as a grounding electrode when_. _
    (a) the ring is in direct contact with the earth
    (b) the ring consists of at least 20 ft of bare copper conductor
    (c) the bare copper conductor is not smaller than 2 AWG
    (d) all of these

15. The normally noncurrent-carrying metal parts of service equipment, such as _. _, shall be bonded together.
    (a) service raceways or service cable armor
    (b) service equipment enclosures containing service conductors, including meter fittings, boxes, or the like, interposed in the service raceway or armor
    (c) service cable trays
    (d) all of these

16. Where used, the surge protective device shall be connected to the grounded conductor of the circuit.
    (a) True
    (b) False

17. The ampacities listed in 310.15 do not take _. _ into consideration.
    (a) continuous loads
    (b) voltage drop
    (c) insulation
    (d) wet locations

18. Type AC cable installed through, or parallel to, framing members shall be protected against physical damage from penetration by screws or nails.
    (a) True
    (b) False

19. Bends in FMC shall be made so that the conduit is not damaged and the internal diameter of the conduit is _. _
    (a) larger than ¾ in.
    (b) not effectively reduced
    (c) increased
    (d) larger than 1 in.
20. Cable trays shall be supported at intervals in accordance with the installation instructions.
   (a) True
   (b) False

21. A switchboard or panelboard containing a 4-wire, _____ system where the midpoint of one phase winding is grounded, shall be legibly and permanently field-marked to caution that one phase has a higher voltage-to-ground.
   (a) wye-connected
   (b) delta-connected
   (c) solidly grounded
   (d) ungrounded

22. Individual circuits for nonmotor-operated appliances that are continuously loaded shall have the branch-circuit rating sized not less than _____ percent of the appliance marked ampere rating, unless otherwise listed.
   (a) 80
   (b) 100
   (c) 125
   (d) 150

23. For transformers, other than Class 2 and Class 3, a means is required to disconnect all transformer ungrounded primary conductors. The disconnecting means must be located within sight of the transformer unless the disconnect _____.
   (a) location is field marked on the transformer
   (b) is lockable in accordance with 110.25
   (c) is nonfusible
   (d) a and b

24. This Code covers the installation of _____ for public and private premises, including buildings, structures, mobile homes, recreational vehicles, and floating buildings.
   (a) optical fiber cables
   (b) electrical equipment
   (c) raceways
   (d) all of these

25. For a circuit to be considered a multiwire branch circuit, it shall have _____.
   (a) two or more ungrounded conductors with a voltage potential between them
   (b) a grounded conductor having equal voltage potential between it and each ungrounded conductor of the circuit
   (c) a grounded conductor connected to the neutral or grounded terminal of the system
   (d) all of these

26. A conductor used to connect the system grounded conductor or the equipment to a grounding electrode or to a point on the grounding electrode system is called the “_____ conductor.”
   (a) main grounding
   (b) common main
   (c) equipment grounding
   (d) grounding electrode

27. When one electrical circuit controls another circuit through a relay, the first circuit is called a “_____.”
   (a) primary circuit
   (b) remote-control circuit
   (c) signal circuit
   (d) controller

28. Connection of conductors to terminal parts shall ensure a thoroughly good connection without damaging the conductors and shall be made by means of _____.
   (a) solder lugs
   (b) pressure connectors
   (c) splices to flexible leads
   (d) any of these

29. Receptacles shall have the terminal intended for connection to the grounded conductor identified by a metal or metal coating that is substantially _____ in color.
   (a) green
   (b) white
   (c) gray
   (d) b or c
30. The total rating of utilization equipment fastened in place shall not exceed ____ percent of the branch-circuit ampere rating where lighting units and cord-and-plug-connected utilization equipment are supplied.
   (a) 50
   (b) 75
   (c) 100
   (d) 125

31. In a dwelling unit, illumination for outdoor entrances that have grade-level access can be controlled by ____.
   (a) remote
   (b) central
   (c) automatic control
   (d) any of these

32. If a set of 120/240V overhead feeder conductors terminates at a through-the-roof raceway or approved support, with less than 6 ft of these conductors passing over the roof overhang, the minimum clearance above the roof for these conductors is ____.
   (a) 12 in.
   (b) 18 in.
   (c) 2 ft
   (d) 5 ft

33. Where communications cables and electric service drop conductors are supported by the same pole, communications cables must have a minimum separation of ____ in. at any point in the span, including the point of attachment to the building.
   (a) 2
   (b) 6
   (c) 12
   (d) 24

34. The service conductors shall be connected to the service disconnecting means by ____ or other approved means.
   (a) pressure connectors
   (b) clamps
   (c) solder
   (d) a or b

35. Cartridge fuses and fuse holders shall be classified according to their ____ ranges.
   (a) voltage
   (b) amperage
   (c) a or b
   (d) a and b

36. Where the main bonding jumper is installed from the grounded conductor terminal bar to the equipment grounding terminal bar in service equipment, the ____ conductor is permitted to be connected to the equipment grounding terminal bar.
   (a) grounding
   (b) grounded
   (c) grounding electrode
   (d) none of these

37. Grounding electrodes of the rod type less than ____ in. in diameter shall be listed.
   (a) ½ in.
   (b) ¾ in.
   (c) none of these
   (d) none of these

38. Bonding jumpers for service raceways shall be used around impaired connections such as ____.
   (a) oversized concentric knockouts
   (b) oversized eccentric knockouts
   (c) reducing washers
   (d) any of these

39. Wiring methods installed behind panels that allow access shall be ____ according to their applicable articles.
   (a) supported
   (b) painted
   (c) in a metal raceway
   (d) all of these

40. On a three-phase, 4-wire, wye circuit, where the major portion of the load consists of nonlinear loads, the neutral conductor shall be counted when applying 310.15(B)(3)(a) adjustment factors.
   (a) True
   (b) False
41. At Type AC cable terminations, a(n) ____ shall be provided.
   (a) fitting (or box design) that protects the conductors from abrasion
   (b) insulating bushing between the conductors and the cable armor
   (c) a and b
   (d) none of these

42. When FMC is used where flexibility is necessary to minimize the transmission of vibration from equipment or to provide flexibility for equipment that requires movement after installation, ____ shall be installed.
   (a) an equipment grounding conductor
   (b) an expansion fitting
   (c) flexible nonmetallic connectors
   (d) none of these

43. TPT and TST cords shall be permitted in lengths not exceeding _____ ft when attached directly to a portable appliance rated 50W or less.
   (a) 8
   (b) 10
   (c) 15
   (d) 20

44. When separate equipment grounding conductors are provided in panelboards, a ____ shall be secured inside the cabinet.
   (a) grounded conductor
   (b) terminal lug
   (c) terminal bar
   (d) none of these

45. Wall-mounted ovens and counter-mounted cooking units shall be permitted to be ____.
   (a) permanently connected
   (b) cord-and-plug-connected
   (c) a or b
   (d) none of these

46. A vented alkaline-type battery, as it relates to storage batteries, operating at not over 250V shall be installed with not more than ____ cells in the series circuit of any one tray.
   (a) 10
   (b) 12
   (c) 18
   (d) 20

47. The NEC does not cover electrical installations in ships, watercraft, railway rolling stock, aircraft, or automotive vehicles.
   (a) True
   (b) False

48. The NEC defines a(n) "____" as a structure that stands alone or that is cut off from adjoining structures by fire walls or fire barriers, with all openings therein protected by approved fire doors.
   (a) unit
   (b) apartment
   (c) building
   (d) utility

49. A "____" is an accommodation that combines living, sleeping, sanitary, and storage facilities within a compartment.
   (a) guest room
   (b) guest suite
   (c) dwelling unit
   (d) single-family dwelling

50. Equipment enclosed in a case or cabinet with a means of sealing or locking so that live parts cannot be made accessible without opening the enclosure is said to be "____".
   (a) guarded
   (b) protected
   (c) sealable
   (d) lockable

51. Each disconnecting means shall be legibly marked to indicate its purpose unless located and arranged so ____.
   (a) that it can be locked out and tagged
   (b) it is not readily accessible
   (c) the purpose is evident
   (d) that it operates at less than 300 volts-to-ground
52. The screw shell of a luminaire or lampholder shall be connected to the ____:
   (a) grounded conductor
   (b) ungrounded conductor
   (c) equipment grounding conductor
   (d) forming shell terminal

53. ____ in dwelling units shall supply only loads within that dwelling unit or loads associated only with that dwelling unit.
   (a) Service-entrance conductors
   (b) Ground-fault protection
   (c) Branch circuits
   (d) none of these

54. In a dwelling unit, at least one lighting outlet ____ shall be located at the point of entry to the attic, underfloor space, utility room, or basement where these spaces are used for storage or contain equipment requiring servicing.
   (a) that is unswitched
   (b) containing a switch
   (c) controlled by a wall switch
   (d) b or c

55. A building or structure shall be supplied by a maximum of ____ feeder(s) or branch circuit(s), unless specifically permitted otherwise.
   (a) one
   (b) two
   (c) three
   (d) four

56. The general requirement for each service drop, set of overhead service conductors, set of underground service conductors, or service lateral is that it shall supply ____ set(s) of service-entrance conductors.
   (a) only one
   (b) only two
   (c) up to six
   (d) an unlimited number of

57. The next higher standard rating overcurrent device above the ampacity of the ungrounded conductors being protected shall be permitted to be used, provided the ____.
   (a) conductors are not part of a branch circuit supplying more than one receptacle for cord-and-plug-connected portable loads
   (b) ampacity of the conductors doesn’t correspond with the standard ampere rating of a fuse or circuit breaker
   (c) next higher standard rating selected doesn’t exceed 800A
   (d) all of these

58. Circuit breakers used to switch high-intensity discharge lighting circuits shall be listed and marked as ____.
   (a) SWD
   (b) HID
   (c) a or b
   (d) a and b

59. A grounding electrode conductor, sized in accordance with 250.66, shall be used to connect the equipment grounding conductors, the service-equipment enclosures, and, where the system is grounded, the grounded service conductor to the grounding electrode(s).
   (a) True
   (b) False

60. Where the supplemental electrode is a rod, that portion of the bonding jumper that is the sole connection to the supplemental grounding electrode shall not be required to be larger than ____ AWG copper.
   (a) 8
   (b) 6
   (c) 4
   (d) 1

61. At existing buildings or structures, an intersystem bonding termination is not required if other acceptable means of bonding exits. An external accessible means for bonding communications systems together can be by the use of a(n) ____.
   (a) nonflexible metallic raceway
   (b) exposed grounding electrode conductor
   (c) connection to a grounded raceway or equipment approved by the authority having jurisdiction
   (d) any of these
62. Rigid metal conduit that is directly buried outdoors shall have at least ____ in. of cover.
   (a) 6
   (b) 12
   (c) 18
   (d) 24

63. Surface-type cabinets, cutout boxes, and meter socket enclosures in damp or wet locations shall be mounted so there is at least ____ in. airspace between the enclosure and the wall or supporting surface.
   (a) 1/16
   (b) 1/4
   (c) 1/4
   (d) 6

64. Type MC cable containing four or fewer conductors, sized no larger than 10 AWG, shall be secured within ____ in. of every box, cabinet, fitting, or other cable termination.
   (a) 8
   (b) 12
   (c) 18
   (d) 24

65. ____ connectors shall not be concealed when used in installations of LFMC.
   (a) Straight
   (b) Angle
   (c) Grounding-type
   (d) none of these

66. Flexible cords and cables shall be protected by ____ where passing through holes in covers, outlet boxes, or similar enclosures.
   (a) bushings
   (b) fittings
   (c) a or b
   (d) none of these

67. No parts of cord-connected luminaires, chain-, cable-, or cord-suspended luminaires, lighting track, pendants, or paddle fans shall be located within a zone measured 3 ft horizontally and ____ ft vertically from the top of the bathtub rim or shower stall threshold.
   (a) 4
   (b) 6
   (c) 8
   (d) 10

68. Cord-and-plug-connected vending machines manufactured or remanufactured on or after January 1, 2005 shall include a ground-fault circuit interrupter identified for portable use as an integral part of the attachment plug or in the power-supply cord within 12 in. of the attachment plug. Older vending machines not incorporating integral GFCI protection shall be ____.
   (a) remanufactured
   (b) disabled
   (c) connected to a GFCI-protected outlet
   (d) connected to an AFCI-protected circuit

69. Communications wiring such as telephone, antenna, and CATV wiring within a building shall not be required to comply with the installation requirements of Chapters 1 through 7, except where specifically referenced in Chapter 8.
   (a) True
   (b) False

70. A communications raceway is an enclosed channel of nonmetallic materials designed for holding communications wires and cables in ____ applications.
   (a) plenum
   (b) riser
   (c) general-purpose
   (d) all of these

71. Within sight means visible and not more than ____ ft distant from the equipment.
   (a) 10
   (b) 20
   (c) 25
   (d) 50
72. The overhead system service-entrance conductors are the service conductors between the terminals of _____ and a point where they are joined by a tap or splice to the service drop or overhead service conductors.

(a) service equipment
(b) service point
(c) grounding electrode
(d) equipment grounding conductor

73. The NEC requires tested series-rated installations of circuit breakers or fuses to be legibly marked in the field to indicate the equipment has been applied with a series combination rating.

(a) True
(b) False

74. The ungrounded and grounded conductors of each _____ shall be grouped by wire ties or similar means at the panelboard or other point of origination.

(a) branch circuit
(b) multiwire branch circuit
(c) feeder circuit
(d) service-entrance conductor

75. Receptacle outlets in or on floors shall not be counted as part of the required number of receptacle outlets for dwelling unit wall spaces, unless they are located within _____ in. of the wall.

(a) 6
(b) 12
(c) 18
(d) 24

77. The disconnecting means for a building supplied by a feeder shall be installed at a(n) _____ location.

(a) accessible
(b) readily accessible
(c) outdoor
(d) indoor

78. A single-family dwelling unit and its accessory structure(s) shall be permitted to have one set of service conductors run to each structure from a single service drop, set of overhead service conductors, set of underground service conductors, or service lateral.

(a) True
(b) False

79. If the circuit's overcurrent device exceeds _____, the conductor ampacity must have a rating not less than the rating of the overcurrent device.

(a) 800A
(b) 1,000A
(c) 1,200A
(d) 2,000A

80. A circuit breaker with a _____ voltage rating, such as 240V or 480V, can be used where the nominal voltage between any two conductors does not exceed the circuit breaker's voltage rating.

(a) straight
(b) slash
(c) high
(d) low

81. A main bonding jumper shall be a _____ or similar suitable conductor.

(a) wire
(b) bus
(c) screw
(d) any of these
82. When a ground ring is used as a grounding electrode, it shall be buried at a depth below the earth’s surface of not less than _____.
(a) 18 in.
(b) 24 in.
(c) 30 in.
(d) 8 ft

83. When bonding enclosures, metal raceways, frames, and fittings, any nonconductive paint, enamel, or similar coating shall be removed at _____.
(a) contact surfaces
(b) threads
(c) contact points
(d) all of these

84. Direct-buried service conductors that are not encased in concrete and that are buried 18 in. or more below grade shall have their location identified by a warning ribbon placed in the trench at least _____ in. above the underground installation.
(a) 6
(b) 10
(c) 12
(d) 18

85. Enclosures for switches or overcurrent devices are allowed to have conductors feeding through where the wiring space at any cross section is not filled to more than _____ percent of the cross-sectional area of the space.
(a) 20
(b) 30
(c) 40
(d) 60

86. Type NM cables shall not be used in one- and two-family dwellings exceeding three floors above grade.
(a) True
(b) False

87. PVC conduit shall not be used _____, unless specifically permitted.
(a) in hazardous (classified) locations
(b) for the support of luminaires or other equipment
(c) where subject to physical damage unless identified for such use
(d) all of these

88. Single-throw knife switches shall be installed so that gravity will tend to close the switch.
(a) True
(b) False

89. The NEC allows a lighting outlet on the wall in a clothes closet when it is at least 6 in. away from storage space.
(a) True
(b) False

90. Electric space-heating cables shall not extend beyond the room or area in which they _____.
(a) provide heat
(b) originate
(c) terminate
(d) are connected

91. Chapters 1 through 4 of the NEC apply _____.
(a) generally to all electrical installations
(b) only to special occupancies and conditions
(c) only to special equipment and material
(d) all of these

92. A separate portion of a raceway system that provides access through a removable cover(s) to the interior of the system, defines the term _____.
(a) junction box
(b) accessible raceway
(c) conduit body
(d) cutout box
93. The highest current at rated voltage that a device is identified to interrupt under standard test conditions is the _____.
   (a) interrupting rating
   (b) manufacturer's rating
   (c) interrupting capacity
   (d) withstand rating

94. The underground system service-entrance conductors are the service conductors between the terminals of _____ and the point of connection to the service lateral or underground service conductors.
   (a) service equipment
   (b) service point
   (c) grounding electrode
   (d) equipment grounding conductor

95. Concrete, brick, or tile walls are considered _____, as applied to working space requirements.
   (a) inconsequential
   (b) in the way
   (c) grounded
   (d) none of these

96. Where more than one nominal voltage system supplies branch circuits in a building, each _____ conductor of a branch circuit shall be identified by phase and system at all termination, connection, and splice points.
   (a) grounded
   (b) ungrounded
   (c) grounding
   (d) all of these

97. Receptacles installed for countertop surfaces as required by 210.52(c) shall not be used to meet the receptacle requirements for wall space as required by 210.52(A).
   (a) True
   (b) False

98. Where a premises wiring system contains feeders supplied from more than one nominal voltage system, each ungrounded conductor of a feeder shall be identified by phase or line and system by _____, or other approved means.
   (a) color coding
   (b) marking tape
   (c) tagging
   (d) any of these

99. A building disconnecting means that supplies only limited loads of a single branch circuit shall have a rating of not less than _____.
   (a) 15A
   (b) 20A
   (c) 25A
   (d) 30A

100. Service-entrance cables which are not installed underground, where subject to physical damage, shall be protected by _____.
    (a) rigid metal conduit
    (b) IMC
    (c) Schedule 80 PVC conduit
    (d) any of these
1. Supplementary overcurrent devices used in luminaires or appliances are not required to be readily accessible.
   (a) True
   (b) False

2. For grounded systems, normally noncurrent-carrying conductive materials enclosing electrical conductors or equipment shall be connected to earth so as to limit the voltage-to-ground on these materials.
   (a) True
   (b) False

3. Where a supply-side bonding jumper of the wire type is run with the derived phase conductors from the source of a separately derived system to the first disconnecting means, it shall be sized in accordance with 250.102(C), based on _____.
   (a) the size of the primary conductors
   (b) the size of the secondary overcurrent protection
   (c) the size of the derived ungrounded conductors
   (d) one third the size of the primary grounded conductor

4. Grounding electrode conductors of the wire type shall be _____.
   (a) solid
   (b) stranded
   (c) insulated or bare
   (d) any of these

5. What is the minimum size copper equipment bonding jumper for a 40A rated circuit?
   (a) 14 AWG
   (b) 12 AWG
   (c) 10 AWG
   (d) 8 AWG

6. Cables or raceways installed using directional boring equipment shall be _____. for this purpose.
   (a) marked
   (b) listed
   (c) labeled
   (d) approved

7. When counting the number of conductors in a box, a conductor running through the box with an unbroken loop or coil not less than twice the minimum length required for free conductors shall be counted as _____. conductor(s).
   (a) one
   (b) two
   (c) three
   (d) four
8. Grommets or bushings for the protection of Type NM cable shall be _____ for the purpose.
   (a) marked
   (b) approved
   (c) identified
   (d) listed

9. EMT, elbows, couplings, and fittings can be installed in concrete, in direct contact with the earth, or in areas subject to severe corrosive influences if ____.
   (a) protected by corrosion protection
   (b) approved as suitable for the condition
   (c) a and b
   (d) listed for wet locations

10. The metal mounting yoke of a replacement switch isn’t required to be connected to an equipment grounding conductor if the wiring at the existing switch doesn’t contain an equipment grounding conductor, and ____.
    (a) the switch faceplate is nonmetallic with nonmetallic screws
    (b) the replacement switch is GFCI protected
    (c) a or b
    (d) the circuit is AFCI protected

11. Metal raceways shall be bonded to the metal pole with a(n) ____.
    (a) grounding electrode
    (b) grounded conductor
    (c) equipment grounding conductor
    (d) any of these

12. Torque requirements for motor control circuit device terminals shall be a minimum of ____ lb-in. (unless otherwise identified) for screw-type pressure terminals used for 14 AWG and smaller copper conductors.
    (a) 7
    (b) 9
    (c) 10
    (d) 15

13. In the NEC, the words “_____” indicate a mandatory requirement.
    (a) shall
    (b) shall not
    (c) shall be permitted
    (d) a or b

14. An enclosure or piece of equipment constructed so that dust will not enter the enclosure under specified test conditions is known as “_____.”
    (a) dusttight
    (b) dustproof
    (c) dust rated
    (d) all of these

15. Lighting track is a manufactured assembly designed to support and ____ luminaires that are capable of being readily repositioned on the track.
    (a) connect
    (b) protect
    (c) energize
    (d) all of these

16. A structure is that which is built or constructed.
    (a) True
    (b) False

17. The required working space for access to live parts operating at 300 volts-to-ground, where there are exposed live parts on one side and grounded parts on the other side, is ____.
    (a) 3 ft
    (b) 3½ ft
    (c) 4 ft
    (d) 4½ ft

18. All 15A and 20A, 125V receptacles installed in crawl spaces at or below grade level of dwelling units shall have GFCI protection.
    (a) True
    (b) False
19. When breaks occur in dwelling unit kitchen countertop spaces for range tops, refrigerators or sinks, each countertop surface shall be considered a separate counter space for determining receptacle placement.
   (a) True
   (b) False

20. The 3 VA per-square-foot general lighting load for dwelling units includes general-use receptacles and lighting outlets.
   (a) True
   (b) False

21. For installations consisting of not more than two 2-wire branch circuits, the building disconnecting means shall have a rating of not less than ____.
   (a) 15A
   (b) 20A
   (c) 25A
   (d) 30A

22. Individual open conductors and cables, other than service-entrance cables, shall not be installed within ____ ft of grade level or where exposed to physical damage.
   (a) 8
   (b) 10
   (c) 12
   (d) 15

23. Ground-fault protection of equipment shall be provided for solidly grounded wye electrical systems of more than 150 volts-to-ground, but not exceeding 1,000V phase-to-phase for each individual device used as a building or structure main dis-connecting means rated ____ or more, unless specifically exempted.
   (a) 1,000A
   (b) 1,500A
   (c) 2,000A
   (d) 2,500A

24. For grounded systems, normally noncurrent-carrying conductive materials enclosing electrical conductors or equipment, or forming part of such equipment, shall be connected together and to the ____ to establish an effective ground-fault current path.
   (a) ground
   (b) earth
   (c) electrical supply source
   (d) none of these

25. The grounding electrode for a separately derived system shall be as near as practicable to, and preferably in the same area as, the grounding electrode conductor connection to the system.
   (a) True
   (b) False

26. Where used outside, aluminum or copper-clad aluminum grounding electrode conductors shall not be terminated within ____ of the earth.
   (a) 6 in.
   (b) 12 in.
   (c) 15 in.
   (d) 18 in.

27. An equipment bonding jumper can be installed on the outside of a raceway, providing the length of the equipment bonding jumper is not more than ____ and the equipment bonding jumper is routed with the raceway.
   (a) 12 in.
   (b) 24 in.
   (c) 36 in.
   (d) 72 in.

28. An exposed wiring system for indoor wet locations where walls are frequently washed shall be mounted so that there is at least a ____ between the mounting surface and the electrical equipment.
   (a) ¼ in. airspace
   (b) separation by insulated bushings
   (c) separation by noncombustible tubing
   (d) none of these
29. Conduit bodies that are durably and legibly marked by the manufacturer with their volume can contain splices, taps, or devices
   (a) True
   (b) False

30. Type _____ cable is an assembly primarily used for services.
   (a) NM
   (b) TC
   (c) SE
   (d) none of these

31. When a building is supplied with a fire sprinkler system, ENT can be installed above any suspended ceiling.
   (a) True
   (b) False

32. Snap switches rated _____ or less directly connected to aluminum conductors shall be listed and marked CO/ALR.
   (a) 15A
   (b) 20A
   (c) 25A
   (d) 30A

33. Luminaires that require adjustment or aiming after installation can be cord-connected without an attachment plug, provided the exposed cord is of the hard-usage type and is not longer than that required for maximum adjustment.
   (a) True
   (b) False

34. The motor branch-circuit short-circuit and ground-fault protective device shall be capable of carrying the _____ current of the motor.
   (a) varying
   (b) starting
   (c) running
   (d) continuous

35. When the Code uses “_____,” it means the identified actions are allowed but not required, and they may be options or alternative methods.
   (a) shall
   (b) shall not
   (c) shall be permitted
   (d) a or b

36. “Continuous duty” is defined as _____.
   (a) when the load is expected to continue for five hours or more
   (b) operation at a substantially constant load for an indefinitely long time
   (c) operation at loads and for intervals of time, both of which may be subject to wide variations
   (d) operation at which the load may be subject to maximum current for six hours or more

37. Equipment or materials included in a list published by a testing laboratory acceptable to the authority having jurisdiction is said to be “_____.”
   (a) book
   (b) digest
   (c) manifest
   (d) listed

38. A surge-protective device ( SPD) intended for installation on the load side of the service disconnect overcurrent device, including SPDs located at the branch panel, is a _____ SPD.
   (a) Type 1
   (b) Type 2
   (c) Type 3
   (d) Type 4

39. When normally enclosed live parts are exposed for inspection or servicing, the working space, if in a passageway or general open space, shall be suitably _____.
   (a) accessible
   (b) guarded
   (c) open
   (d) enclosed
40. All 15A and 20A, 125V receptacles installed in _____ of dwelling units shall have GFCI protection.
(a) unfinished attics
(b) finished attics
(c) unfinished basements and crawl spaces
(d) finished basements

41. Kitchen and dining room countertop receptacle outlets in dwelling units shall be installed above the countertop surface, and not more than _____ in. above the countertop.
(a) 12
(b) 18
(c) 20
(d) 24

42. Branch circuits that supply lighting units that have ballasts, autotransformers, or LED drivers shall have the calculated load based on _____ of the units, not to the total wattage of the lamps.
(a) 50 percent of the rating
(b) 80 percent of the rating
(c) the total ampere rating
(d) 150 percent of the rating

43. Conductors are considered outside a building when they are installed _____.
(a) Under not less than 2 in. of concrete beneath a building or structure
(b) Within a building or structure in a raceway encased in not less than a 2 in. thickness of concrete or brick
(c) Installed in a vault that meets the construction requirements of Article 450, Part III
(d) all of these

44. Service-entrance and overhead service conductors shall be arranged so that _____ will not enter the service raceway or equipment.
(a) dust
(b) vapor
(c) water
(d) none of these

45. Overcurrent devices shall be _____.
(a) accessible (as applied to wiring methods)
(b) accessible (as applied to equipment)
(c) readily accessible
(d) inaccessible to unauthorized personnel

46. Electrically conductive materials that are likely to _____ in ungrounded systems shall be connected together and to the supply system grounded equipment in a manner that creates a low-impedance path for ground-fault current that is capable of carrying the maximum fault current likely to be imposed on it.
(a) become energized
(b) require service
(c) be removed
(d) be coated with paint or nonconductive materials

47. Tap connections to a common grounding electrode conductor for multiple separately derived systems may be made to a copper or aluminum busbar that is _____.
(a) smaller than \(\frac{1}{4}\) in. x 4 in.
(b) not smaller than \(\frac{1}{4}\) in. x 2 in.
(c) not smaller than \(\frac{1}{2}\) in. x 2 in.
(d) a and c

48. A grounding electrode conductor shall be permitted to be run to any convenient grounding electrode available in the grounding electrode system where the other electrode(s), if any, is connected by bonding jumpers in accordance with 250.53(C).
(a) True
(b) False

49. Lightning protection system ground terminals _____ be bonded to the building or structure grounding electrode system.
(a) shall
(b) shall not
(c) shall be permitted to
(d) none of these

50. Electrical wiring within the cavity of a fire-rated floor-ceiling or roof-ceiling assembly shall not be supported by the ceiling assembly or ceiling support wires.
(a) True
(b) False
51. ____ can be used to fasten boxes to a structural member using brackets on the outside of the enclosure.
   (a) Nails
   (b) Screws
   (c) Bolts
   (d) a and b

52. The ampacity of Type UF cable shall be that of ____ conductors in accordance with 310.15.
   (a) 60°C
   (b) 75°C
   (c) 90°C
   (d) 105°C

53. Bushings or adapters shall be provided at ENT terminations to protect the conductors from abrasion, unless the box, fitting, or enclosure design provides equivalent protection.
   (a) True
   (b) False

54. Where a grounding means exists in the receptacle enclosure a(n) ____-type receptacle shall be used.
   (a) isolated ground
   (b) grounding
   (c) GFCI
   (d) dedicated

55. Lampholders installed in damp locations shall be listed for use in ____ locations.
   (a) damp
   (b) wet
   (c) dry
   (d) a or b

56. The motor controller shall have horsepower ratings at the application voltage not ____ the horsepower rating of the motor.
   (a) lower than
   (b) higher than
   (c) equal to
   (d) none of these

57. Admitting close approach not guarded by locked doors, elevation, or other effective means, is referred to as ____.
   (a) accessible (as applied to equipment)
   (b) accessible (as applied to wiring methods)
   (c) accessible, readily
   (d) all of these

58. As used in the NEC, equipment includes ____.
   (a) fittings
   (b) appliances
   (c) machinery
   (d) all of these

59. “Nonautomatic” is defined as requiring ____ to perform a function.
   (a) protection from damage
   (b) human intervention
   (c) mechanical linkage
   (d) all of these

60. A(n) ____ enclosure is constructed or protected so that exposure to the weather will not interfere with successful operation.
   (a) weatherproof
   (b) weathertight
   (c) weather-resistant
   (d) all weather

61. For equipment rated 1,200A or more and over 6 ft wide that contains overcurrent devices, switching devices, or control devices, there shall be one entrance to and egress from the required working space not less than 24 in. wide and ____ high at each end of the working space.
   (a) 5½ ft
   (b) 6 ft
   (c) 6½ ft
   (d) any of these

62. In other than dwelling locations, GFCI protection is required in ____.
   (a) indoor wet locations
   (b) locker rooms with associated showering facilities
   (c) garages, service bays, and similar areas other than vehicle exhibition halls and showrooms
   (d) all of these
63. At least one receptacle outlet not more than _____ above a balcony, deck, or porch shall be installed at each balcony, deck, or porch that is attached to and accessible from a dwelling unit.
   (a) 3 ft
   (b) 6½ ft
   (c) 8 ft
   (d) 24 in.

64. The load for electric clothes dryers in a dwelling unit shall be _____ watts or the nameplate rating, whichever is larger, per dryer.
   (a) 1,500
   (b) 4,500
   (c) 5,000
   (d) 8,000

65. Service conductors installed in overhead masts on the outside surface of the building traveling through the eave, but not the wall, of that building are considered to be outside of the building.
   (a) True
   (b) False

66. On a three-phase, 4-wire, delta-connected service where the midpoint of one phase winding is grounded, the service conductor having the higher phase voltage-to-ground shall be durably and permanently marked by an outer finish that is _____ in color, or by other effective means, at each termination or junction point.
   (a) orange
   (b) red
   (c) blue
   (d) any of these

67. Overcurrent devices shall be readily accessible and installed so the center of the grip of the operating handle of the switch or circuit breaker, when in its highest position, is not more than _____ above the floor or working platform.
   (a) 2 ft
   (b) 4 ft 6 in.
   (c) 5 ft
   (d) 6 ft 7 in.

68. In ungrounded systems, electrical equipment, wiring, and other electrically conductive material likely to become energized shall be installed in a manner that creates a low-impedance circuit from any point on the wiring system to the electrical supply source to facilitate the operation of overcurrent devices should a(n) _____ fault from a different phase occur on the wiring system.
   (a) isolated ground
   (b) second ground
   (c) arc
   (d) high impedance

69. In an area served by a separately derived system, the _____ shall be connected to the grounded conductor of the separately derived system.
   (a) structural steel
   (b) metal piping
   (c) metal building skin
   (d) a and b

70. A service consisting of 12 AWG service-entrance conductors requires a grounding electrode conductor sized no less than _____.
   (a) 10 AWG
   (b) 8 AWG
   (c) 6 AWG
   (d) 4 AWG

71. Type MC cable provides an effective ground-fault current path and is recognized by the NEC as an equipment grounding conductor when _____.
   (a) it contains an insulated or uninsulated equipment grounding conductor in compliance with 250.118(1)
   (b) the combined metallic sheath and uninsulated equipment grounding/bonding conductor of interlocked metal tape-type MC cable is listed and identified as an equipment grounding conductor
   (c) only when it is hospital grade Type MC cable
   (d) a or b
72. In multiwire branch circuits, the continuity of the ____ conductor shall not be dependent upon the device connections.
   (a) ungrounded  
   (b) grounded  
   (c) grounding electrode  
   (d) a and b

73. Boxes used at luminaire or lampholder outlets in a ceiling shall be designed so that a luminaire or lampholder can be attached and the boxes shall be required to support a luminaire weighing a minimum of ____ lb.
   (a) 20  
   (b) 30  
   (c) 40  
   (d) 50

74. Trade size 1 IMC shall be supported at intervals not exceeding ____ ft.
   (a) 8  
   (b) 10  
   (c) 12  
   (d) 14

75. The ampacity adjustment factors in 310.15(B)(3)(a) shall be applied to a metal wireway only where the number of current-carrying conductors in any cross section of the wireway exceeds ____.
   (a) 30  
   (b) 40  
   (c) 50  
   (d) 60

76. Receptacles mounted to and supported by a cover shall be secured by more than one screw unless listed and identified for securing by a single screw.
   (a) True  
   (b) False

77. The raceway or cable for tap conductors to recessed luminaires shall have a minimum length of ____ in.
   (a) 6  
   (b) 12  
   (c) 18  
   (d) 24

78. The disconnecting means for a motor controller shall be designed so that it cannot ____ automatically.
   (a) open  
   (b) close  
   (c) restart  
   (d) shut down

79. Capable of being removed or exposed without damaging the building structure or finish, or not permanently closed in by the structure or finish of the building is known as ____.
   (a) accessible (as applied to equipment)  
   (b) accessible (as applied to wiring methods)  
   (c) accessible, readily  
   (d) all of these

80. Equipment enclosed in a case that is capable of withstanding an explosion of a specified gas or vapor that may occur within it, and of preventing the ignition of a specified gas or vapor surrounding the enclosure by sparks, flashes, or explosion of the gas or vapor within, and that operates at such an external temperature that a surrounding flammable atmosphere will not be ignited thereby defines the phrase "______".
   (a) overcurrent device  
   (b) thermal apparatus  
   (c) explosionproof equipment  
   (d) bomb casing

81. A(n) ____ is a point on the wiring system at which current is taken to supply utilization equipment.
   (a) box  
   (b) receptacle  
   (c) outlet  
   (d) device

82. Equipment intended to interrupt current at fault levels shall have an interrupting rating at nominal circuit voltage sufficient for the current that is available at the line terminals of the equipment.
   (a) True  
   (b) False

83. The dedicated space above a panelboard extends to a dropped or suspended ceiling, which is considered a structural ceiling.
   (a) True  
   (b) False
84. All 15A and 20A, 125V receptacles installed within 6 ft of the outside edge of a sink in locations other than dwelling units must be _____.
   (a) AFCI protected
   (b) GFCI protected
   (c) tamperproof
   (d) a and b

85. A laundry receptacle outlet shall not be required in each dwelling unit of a multifamily building, if laundry facilities are provided on the premises for all building occupants.
   (a) True
   (b) False

86. Using the standard load calculation method, the feeder demand factor for five household clothes dryers is ______ percent.
   (a) 50
   (b) 70
   (c) 85
   (d) 100

87. Service-drop conductors shall have _____.
   (a) sufficient ampacity to carry the load
   (b) adequate mechanical strength
   (c) a or b
   (d) a and b

88. There shall be no more than _____ disconnects installed for each service or for each set of service-entrance conductors as permitted in 230.2 and 230.40.
   (a) two
   (b) four
   (c) six
   (d) eight

89. Plug fuses of the Edison-base type shall be used _____.
   (a) where overfusing is necessary
   (b) as a replacement for existing installations
   (c) as a replacement for Type S fuses
   (d) 50A and above

90. _____ on equipment to be grounded shall be removed from contact surfaces to ensure good electrical continuity.
   (a) Paint
   (b) Lacquer
   (c) Enamel
   (d) any of these

91. High-impedance grounded neutral systems shall be permitted for three-phase ac systems of 480V to 1,000V where _____.
   (a) the conditions of maintenance ensure that only qualified persons service the installation
   (b) ground detectors are installed on the system
   (c) line-to-neutral loads are not served
   (d) all of these

92. Exothermic or irreversible compression connections, together with the mechanical means used to attach to fireproofed structural metal, shall not be required to be accessible.
   (a) True
   (b) False

93. Where conductors are run in parallel in multiple raceways or cables and include an EGC of the wire type, the equipment grounding conductor must be installed in parallel in each raceway or cable, sized in compliance with 250.122.
   (a) True
   (b) False

94. Raceways shall be _____ between outlet, junction, or splicing points prior to the installation of conductors.
   (a) installed complete
   (b) tested for ground faults
   (c) a minimum of 60 percent complete
   (d) none of these

95. Power distribution blocks shall be permitted in pull and junction boxes over 100 cubic inches when they comply with the provisions of 314.28(E)(1) through (5).
   (a) True
   (b) False
96. Galvanized steel, stainless steel, and red brass RMC shall be permitted in or under cinder fill subject to permanent moisture, when protected on all sides by a layer of noncinder concrete not less than _____ in. thick.
   (a) 2
   (b) 4
   (c) 6
   (d) 18

97. Surface metal raceways and associated fittings shall be supported _____.
   (a) in accordance with the manufacturer’s installation instructions
   (b) at intervals appropriate for the building design
   (c) at intervals not exceeding 4 ft
   (d) at intervals not exceeding 8 ft

98. Nonlocking 15A and 20A, 125V and 250V receptacles installed in damp locations shall be listed as _____.
   (a) raintight
   (b) watertight
   (c) weatherproof
   (d) weather resistant

99. Lighting track fittings can be equipped with general-purpose receptacles.
   (a) True
   (b) False

100. Where the air conditioner disconnecting means is not within sight from the equipment, the disconnecting means must be _____.
    (a) guarded
    (b) exposed
    (c) lockable
    (d) elevated
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<td>41.</td>
<td>(c)</td>
<td>320.40</td>
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<td>42.</td>
<td>(a)</td>
<td>348.60</td>
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<td>43.</td>
<td>(a)</td>
<td>400.4, Table Note 11</td>
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<td>44.</td>
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<td>408.40</td>
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Final Exam B

1. (a) 240.10.
2. (a) 250.4(A)(2)
3. (c) 250.30(A)(2)(a)
4. (d) 250.62
5. (c) 250.102(D) and Table 250.122
6. (d) 300.5(K)
7. (b) 314.16(B)(1)
8. (d) 334.17
9. (c) 358.10(B)
10. (c) 404.9(B) Ex 1 to (B)
11. (c) 410.30(B)(5)
12. (a) 430.9(C)
13. (d) 90.5(A)
14. (a) 100 Dusttight
15. (c) 100 Lighting Track (Track Lighting)
16. (a) 100 Structure
17. (b) 110.26(A)(1) and Table 110.26(A)(1), Condition 2
18. (a) 210.8(A)(4)
19. (a) 210.52(C)(4)
20. (a) 220.14(J)
21. (d) 225.39(B)
22. (b) 230.50(B)(2)
23. (a) 240.13
24. (c) 250.4(A)(3)
25. (a) 250.30(A)(4)
26. (d) 250.64(A)
27. (d) 250.102(E)(2)
28. (a) 300.6(D)
29. (a) 314.16(C)(2)
30. (c) 338.2 Service-Entrance Cable
31. (a) 362.10(5) Ex
32. (b) 404.14(C)
33. (a) 410.62(B)
34. (b) 430.52(B)
35. (c) 90.5(B)
36. (b) 100 Duty, Continuous
37. (d) 100 Listed
38. (b) 100 Surge Protective Devices (SPDs)
39. (b) 110.26(B)
40. (c) 210.8(A)(4) and (5)
41. (c) 210.52(C)(5)
42. (c) 220.18(B)
43. (d) 230.6(1), (2), and (3)
44. (c) 230.54(G)
45. (c) 240.24(A)
46. (a) 250.4(B)(3)
47. (b) 250.30(A)(6)(c)(2)
48. (a) 250.64(F)(1)
49. (a) 250.106
50. (a) 300.11(A)(1)
51. (d) 314.23(B)(1)
52. (a) 340.80
53. (a) 362.46
54. (b) 406.4(D)(1)
55. (d) 410.96
56. (a) 430.83(A)(1)
57. (a) 100 Accessible (as applied to equipment)
58. (d) 100 Equipment
59. (b) 100 Nonaesthetic
60. (a) 100 Weatherproof
61. (c) 110.26(C)(2)
62. (d) 210.8(B)(6), (7), and (8)
63. (b) 210.52(E)(3)
64. (c) 220.54
65. (a) 230.6(5)
66. (a) 230.55
67. (d) 240.24(A)
68. (b) 250.4(B)(4)
69. (d) 250.30(A)(8)
70. (b) 250.66 and Table 250.66
71. (c) 250.118(10)
72. (b) 300.13(B)
73. (d) 314.27(A)(2)
74. (b) 342.30(B)(1)
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