**Republic of the Philippines**
**PROFESSIONAL REGULATION COMMISSION**
**Manila**

**BOARD OF ELECTRICAL ENGINEERING**

**REGISTERED MASTER ELECTRICIAN Licensure Examination**

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TECHNICAL SUBJECTS

INSTRUCTION: Select the correct answer for each of the following questions. Mark only one answer for each item by shading the box corresponding on the letter of your choice on the answer sheet provided. STRICTLY NO ERASURES ALLOWED. Use pencil No. 1 only.

MULTIPLE CHOICE

1. The output voltage of a single loop generator is a
   a. steady d.c.
   **c. pulsating a.c.**
   b. steady a.c.
   d. pulsating d.c.

2. How would you determine, from visual observation of the armature winding, whether a generator is lap or wave wound.
   a. connection to the field winding
   **b. connection to commutator**
   c. connection to brushes
   d. the direction of the end connection

3. What classification is given you a DC generator that receives its field excitation current from internal source?
   **a. self excited**
   b. controlled excitation
   c. separately excited
   d. internally excited

4. A DC generator supplies a load of resistance 1.4 ohms through a pair of wires having a total resistance of 0.10 ohm. The voltage at the DC generator terminals is 120 V, what is the voltage across the load?
   a. 110 V  b. 105 V  **c. 112 V**  d. 115 V

5. Find the voltage regulation of a generator when full-load voltage is 110 V and no-load voltage is 120 V.
   a. 1%  **b. 9.09%**  c. 90.9%  d. 10%

6. The shunt field of a compound generator is connected across both the series field and the armature. This connection is known as
   a. short shunt
   c. differential compound
   b. **long shunt**
   d. cumulative compound

7. A 25-hp engine drives a DC generator, if the generator has an efficiency of 90 %, how much does it deliver?
   a. **22.5 hp** b. 24 hp c. 21 hp d. 25 hp

8. Residual magnetism is necessary in a
   a. **separately excited generator** c. both of these
   b. self excited generator d. none of these

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9. If commutator is dirty, clean using
   a. sandpaper b. emery **c. cloth** d. oil

10. Which of the following causes extreme sparking at the brushes?
    a. worn bearing
    b. loose coupling
    c. **dirt on the commutator segment**
    d. shaft misalignment

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11. What is the overall efficiency of a 50-hp that draws 20 A at 2400 volts?
    a. 90% b. 87.8% c. 80% **d. 77.7%**

12. What is the common method of cooling transformer?
    **a. natural cooling** b. air cooling c. air blast cooling d. oil cooling

13. A 50-kVA transformer has a primary voltage of 6600 volts and a secondary voltage of 250 volts. It has 100 turns on the secondary winding. Find the number of primary turns.
    a. 1336 turns b. 1373 turns **c. 2640 turns** d. 1733 turns

14. The starting capacitor of a single-phase motor is generally a
    a. ceramic capacitor b. paper capacitor **c. electrolytic capacitor** d. none of these

15. A single phase motor is taking 20 A from a 400-V supply at unity pf. What is the power taken?
    a. 6,000 W **b. 8,000 W** c. 4,000 W d. None of these

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16. At what speed must an 8-pole, AC generator runs so that its frequency shall be 40 Hz?
    a. 750 rpm **b. 600 rpm** c. 900 rpm d. 500 rpm

17. A certain alternator has 8 poles. At what speed must the alternator runs in order to have a generated emf whose frequency is 40 Hz?
    a. 580 rpm b. 750 rpm c. 700 rpm **d. 600 rpm**

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18. When the speed of the alternator increases, the frequency
    a. varies exponentially b. remains the same **c. increases** d. decreases

19. What limits the size of an induction motor that can be started across the line?
    a. Distribution system network
    b. **Horsepower rating**
    c. Branch circuit protection
    d. Power supply

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20. Wound rotors are usually started by the use of what type of starter?
    a. secondary resistance starter
    b. primary resistance starter
    c. auto transformer type
    d. **wye-delta starter**

21. To measure the power taken by a DC electric motor with only a single instrument you should use
    a. voltmeter  b. an ammeter  **c. a wattmeter**  d. a power factor meter

22. The speed of a DC shunt motor is generally regulated by means of a
    a. switch for reversal of the armature supply
    b. source of variable supply voltage
    c. variable resistance in the armature circuit
    **d. rheostat in the field circuit**

23. A carbon brush in a DC motor should exert a pressure of about 1 ½ lbs. per square inch on the commutator. A much lighter pressure would be most likely to result in
    **a. sparking at the commutator**
    b. vibration of the armature
    c. the brush getting out of line
    d. excessive wear of the brush holder

24. If the no-load speed of a squirrel cage type induction motor connected to a three phase 25 cycle line is 373 rpm, the motor has
    a. 2 poles  b. 4 poles  c. 6 poles  **d. 8 poles**

25. The input to a motor is 16,000 watts and the motor losses total 3,000 watts. The efficiency of the motor is most nearly
    a. 68.4%  **b. 81.25%**  c. 84.21%  d. 87.5%

26. While a certain DC shunt motor is driving a light load, part of the field winding becomes short circuited. The motor will most likely
    **a. increase its speed**  **b.** decrease its speed
    c. remain at the same speed  d. come to a stop

27. When a certain motor is started up, the incandescent lights fed from the same circuit dim sown somewhat and then return to approximately normal brightness as the motor comes up to speed. This definitely shows that the
    **a. starting current of the motor is larger than the running current**
    b. insulation of the circuit wiring is worn
    c. circuit fuse is not making good contact

d. incandescent lamps are too large for the circuit

28. If a single-phase induction motor draws 10 amperes at 240 volts, the power taken by the motor
a. will be 2400 watts
b. will be more than 2400 watts
**c. will be less than 2400 watts**
d. may be more or less than 2400 watts depending on the power factor

29. In a method of measuring power in balanced 3-phase system using one wattmeter, total power is the wattmeter deflection multiplied by
a. 1 **b. 2** c. 1.732 d. 1.5

30. In the current transformer method of measuring power in balanced 3-phase system using one wattmeter, total power is the wattmeter deflection multiplied by
a. **1** b. 2 c. 1.7325 d. 1.5

31. It is the power required to drive the unexcited dc machine at normal speed with its brushes lifted
**a. Friction and windings loss** **b.** brush friction loss
c. exciter loss d. ventilation loss

32. In starting a 500 hp, 2300-volt, 3-phase synchronous motor the field winding is initially short circuited so as to
a. produce much larger starting torque
**b. lower voltage produced between the layers of the field winding**
c. increased induced voltage in field winding
d. provide better flux distribution in the air gap

33. In parallel operation of alternator, if the excitation of one alternate is changed it will only change
a. real power taken by the machine
**b. reactive power taken by the machine**
c. apparent power taken by the machine
d. synchronizing power of the machine

34. For parallel operation of DC generators
a. the frequency must be the same
**b. the voltage must be the same**
c. phase sequence must be the same
d. speed must be the same

35. The simplest form of motor controller is
**a. toggle switch** **b.** magnetic switch
c. drum switch d. relay

36. Another name for a magnetic starter is a
a. manual switch b. **manual starter**
c. contactor d. magnetic control

37. A 2- pole AC generator is running at 1,500 rpm. What is the frequency?
**a. 25 Hz** b. 50 Hz c. 60 Hz d. none of these

38. An isolating switch is one that is _____.
**a. intended for cutting off an electrical circuit from its source of power**
b. required to have a padlock
c. primarily used with an isolation transformer
d. used only for heavy motor overloads

39. If full rating of a transformer is 90 kW at a power factor of 0.9 then its kVA rating is
a. 81 **b. 100** c. 90 d. 120

40. An autotransformer is preferred to a conventional 2-winding transformer
a. because it is much safer to use an auto-transformer
b. where large number of secondary taps are needed
**c. where it is required to electrically isolate the two windings**
d. where ratio of transformer is low

41. Current transformers for meters and relays usually have
a. 10-A secondary b. a 10:1 ratio
**c. 5-A secondary** d. a 1:1 ratio

42. The power frequency used for electrical machine in air craft system is preferred to be 400 Hz rather than 60 Hz because
a. More efficient
b. Less Heat and Less Power loss
c. Life span of the machine increase
**d. Less weight**

43. Dust should never be allowed to accumulate on the windings and core of a dry-type transformer because it
a. may short circuit the windings **c. reduces dissipation of heat**
c. tends to corrode metal surfaces d. absorb oil and grease

44. The relative polarity of the windings of a transformer may be determined by
a. short-circuit test c. phasing-out
c. open-circuit test **d. polarity test**

45. The most common cause of contamination by water of oil used in transformer located indoors is
a. condensation of moisture from air in the upper part of the tank
b. **decomposition of organic matter in the oil**
c. leaky bushings
d. use of filter blotters that have absorbed moisture from air

46. Part of the transformer which is most subject to damage from overheating is
a**. winding insulation** c. iron core
c. frame or case d. copper winding

47. In general, the most important point to keep under constant watch during the operation of a transformer is its
a. primary voltage b. copper loss
c. core loss **d. temperature**

48. Oil is invariably used in large transformer in order to
a. insulate the frame b. lubricate the core
**c. insulate the core and the coil** d. lubricate the coils

49. The secondary winding of a current transformer whose primary is carrying current should
a. not be opened-circuited b. not be short-circuited
**c. always be short-circuited** d. not to be connected to the current coil of a wattmeter

50. In relation to a transformer, the ratio 20:1 indicates that
a. there are 20 turns on primary and one turn on secondary
b. primary voltage is $1/20^{th}$ of secondary voltage
c. primary currents is 20 times greater than secondary current
**d. for every 20 turns on primary, there is one turn on secondary**

51. The stray losses in the transformer will be reduces if
a. the liminations are thick
b. number of turns in the primary in winding is reduces
c. the number of turns in the secondary winding is reduces
**d. the liminations are thin and the core is ferromagnetic**

52. The speed of DC series motor at no load is
a. zero b. 1500 rpm **c. Very fast** d. 3000 rpm

53. The function of commutator in DC generator is
a. to change alternating current to direct current
b. to improve commutation
c. for easy control
**d. to change alternating voltage to direct voltage**

54. In practice the rotation of electric motor referred to its back is
a. clockwise
**b. counterclockwise**
c. forward
d. reverse

55. How many contactor is needed to reverse the rotation of a three phase motor
a. three
b. four
**c. six**
d. one

56. For the equal output the total current is more in
a. wave winding **b. lap winding**
c. simplex lap winding d. none of the above

57. What is standard instrument to measure the speed of a motor?
a. pyrometer
b. gyrometer
**c. tachometer**
d. synchroscope

58. If the field of a synchronous motor is under excited the Power factor will be
**a. lagging** b. leading c. unity d. more than unity

59. In a small dc machine, armature slots are sometimes not made axial but skewed. Though skewing makes winding a little more difficult, yet it result in_____.
a**. Quiter operation** b. slight decrease in loss
c. Saving of copper d. decrease power loss

60. In a given machine. How may the no? Of parallel paths be increased in the armature of lop connected.
a. Increasing the number of magnetic pole
b. Increasing the excitation
c. Decreasing the speed
**d. Parallel path is constant, it cannot be altered**

61. In the design of Power Supply, transformer should not be place near the component because of vibration/humming due to
a. magnetostification **b. magnetostriction**
c. ferroresonance d. harmonics

62. Which of the following motor is used in the Electric train?
a. AC series motor b. Induction motor
**c. DC series motor** d. Synchronous motor

63. Which of the following motors has high starting torque?
a. DC shunt motor b. Squirrel cage induction motor
**c. DC series motor** d. AC series motor

64. Which transformer has only one winding.
a. distribution b. power
**c. autotransformer** d. isolated winding transformer

65. What is the equation for the DC generator
**a. E= VT+IaRa** b. E= VT-IaRa
c. E=-VT+IaRa d. E=-VT-IaRa

66. The dummy coil in the DC machines is used to
a. climate armature reaction
**b. bring out mechanical balance of armature**
c. eliminate reactance voltage
d. none of the above

67. A generator has a commercial efficiency of 95% and a mechanical efficiency of 97%. Find the electrical efficiency
**a. 97.94%** b. 92.12% c. 96% d. 91.25%

68. A part of a generator that links the generator to the prime mover
a. yoke b. brush **c. shaft** d. stator

69. A magnet is being heated to a temperature of 460°. What do you think will happen
a. it will become a loadstone b. Magnetic field will increase
c. It will produce demagnetization **d. Magnetism will disappear**

70. What should be the possible no. of poles to obtain the highest operating speed
a. **1** **b. 2** c. 3 d. 4

71. _____ the slot teeth will make the DC generator quieter in operation
**a. Chamfering** b. Slotting c. Pulsating d. Commutating

72. Transformer core uses small frequency because is laminated
a. because it is difficult to fabricate solid core of high frequency
b. because laminated core operating at low frequency provides high flux density
**c. to minimized eddy current and hystressis losses**
d. to increase the main flux

73. The mechanical power developed by the DC motor is maximum when
a. back e.m.f is equal to applied voltage
b. back e.m.f. is equal to zero
**c. back e.m.f. is equal to half the applied voltage**
d. no load

74. A generator may lost residual magnetism because of excessive
a. vibrator b**. heating**
c. over-excitation d. varying loads

75. Which among the following types of motor with same power rating having the same voltage level is the heaviest
a. single phase Motor b. DC shunt Motor
c. Induction Motor **d. DC compound Motor**

76. Electric power is transformed from one coil to the other coil in a transformer
a. Physically b. magnetically c. Electrically **d. electromagnetically**

77. Electric motors are rated in
a. kW **b. BHP** c. kWH d. kVA

78. A hot smoky motor is a good indication of:
a. A ground b. An open c. A and B **d. A short**

79. A transformer is more efficiently utilized when the load has a _____ power factor.
a. low b. medium c. average **d. high**

80. What is the turns ratio on a three-phase, four wire 480/240/120 volt transformer?
a. 3/1 b. 2/1 **c. 4/1** d. ½

81. With a 3$\phi$ delta-wye connected transformer 480 V primary, 208/120 V secondary, the secondary line current is _____.
a. **equal to the secondary phase current** b. greater then the secondary phase current
c. less than the secondary phase current d. 1.732 times the secondary phase current

82. On a delta three-phase four-wire secondary, how many hot wires may use the common neutral?
**a. 1** b. 2 c. 3 d. 4

83. A 25 kVA, 2400/240 volt transformer has a primary current of 10 A. What is the secondary current?
a. 0.10 A **b. 100 A** c. 20 A d. 50 A

84. The standard method of controlling the output voltage of a 440 V, 60 Hz AC generator is accomplished by adjusting the
a. number of poles b. prime mover speed
c. **alternator's field excitation** d. load on the alternator

85. The transformer oil used in a transformer provides
**a. insulation and cooling** b. insulation, cooling and lubrication
c. insulation and lubrication d. cooling and lubrication

86. What is the common method of cooling transformer?
a. **natural cooling** b. air cooling c. air blast cooling d. oil cooling

87. In a squirrel cage induction motor, which component is NOT a part of the motor?
a. stator b. slip rings c. **fan blades** d. rotor

88. A 25-hp engine drives a DC generator, if the generator has an efficiency of 84%, how much does it deliver?
a. 20 hp b. 24 hp **c. 21 hp** d. 25 hp

89. In a DC circuit, the ratio of watts to voltamperes is always _____.
a. unity b. greater than
**c. less than one** d. cannot tell what it might be

90. What is common in the two windings of a transformer
a. electric circuit **b. magnetic circuit** c. winding wire gauge d. none of these

91. Preferably, the resistance between the primary and the secondary of a transformer should be
**a. as low as possible**
b. as high as possible
c. low or high depending upon whether it is step up or step down respectively
d. high or low depending upon whether it is step up or step down respectively

92. The resistance of low voltage side of a transformer
    a. is equal to resistance of its high voltage side
    b. is more than resistance of its high voltage side
    **c. is less than the resistance of its high voltage side**
    d. (b) or (c)

93. The basic property of the transformer is that it changes the voltage level of an a.c. signal
    a. without changing the power
    b. without changing its shape
    c. without changing its frequency
    **d. without changing power, frequency or shape**

94. Transformers are rated in
    a. KW
    b. KV
    c. KWH
    **d. KVA**

95. What type of core is used for a high frequency transformer?
    **a. Air core**
    b. Closed iron core
    c. Aluminum core
    d. Open iron core

96. Which of the following is a correct statement about eddy currents?
    a. Eddy currents improve the efficiency of a motor
    **b. Eddy currents heat up the metal parts**
    c. Eddy current do not influence the movement
    d. Eddy currents are used for arc welding

97. Which of the statement given below is true about autotransformer?
    a. It has two separate windings connected in series externally
    b. It can only step down the voltage
    **c. It has only one winding**
    d. It is most suitable for power transformer

98. In any transformer the voltage per turn in primary and secondary remains
    a. always different
    **b. always same**
    c. always in ratio of 1
    d. sometimes same

99. Power transformers are designed to have maximum efficiency at
    a. no load
    b. half load
    **c. near full load**
    d. little more than full load

100. The size of a transformer core will depend on
    a. frequency
    b. flux density of the core material
    c. area of the core
    **d. (a) and (b) both**