EA/633 **2012** Series **A**

ELECTRICAL ENGINEERING
Paper II

Time : 150 Minutes *Max. Marks : 150*

INSTRUCTIONS

1. Please check the Test Booklet and ensure that it contains all the questions. If you find any defect in the Test Booklet or Answer Sheet, please get it replaced immediately.

2. The Test Booklet contains **150** questions. Each question carries **one** mark.

3. The Test Booklet is printed in four (4) Series, viz. [A] [B] [C] [D]. The Series, [A] or [B] or [C] or [D] is printed on the right-hand corner of the cover page of the Test Booklet. Mark your Test Booklet Series [A] or [B] or [C] or [D] in Part C on side 1 of the Answer Sheet by darkening the appropriate circle with Blue/Black Ball point pen.

Example to fill up the Booklet Series

If your Test Booklet Series is **A**, please fill as shown below :

● Ⓑ Ⓒ Ⓓ

If you have not marked the Test Booklet Series at Part C of side 1 of the Answer Sheet or marked in a way that it leads to discrepancy in determining the exact Test Booklet Series, then, in all such cases, your Answer Sheet will be invalidated without any further notice. No correspondence will be entertained in the matter.

4. Each question is followed by 4 answer choices. Of these, you have to select one correct answer and mark it on the Answer Sheet by darkening the appropriate circle for the question. If more than one circle is darkened, the answer will not be valued at all. Use Blue/Black Ball point pen to make heavy black marks to fill the circle completely. Make **no** other stray marks.

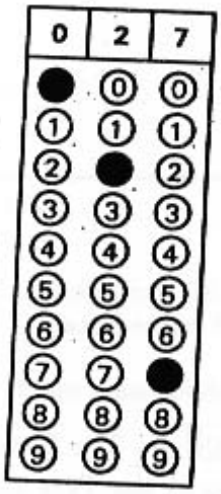
e.g. : If the answer for Question No. 1 is Answer choice (2), it should be marked as follows :

1 | ① | ● | ③ | ④ |

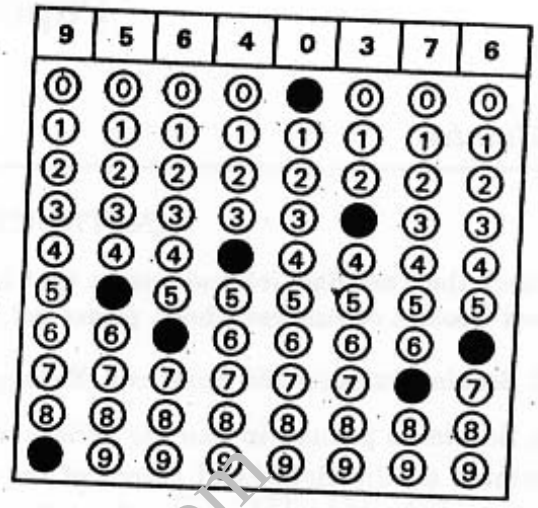
5. Mark Paper Code and Roll No. as given in the Hall Ticket with Blue/Black Ball point pen by darkening appropriate circles in Part A of side 1 of the Answer Sheet. Incorrect/not encoding will lead to ***invalidation*** of your Answer Sheet.

Example : If the Paper Code is **027**, and Roll No. is **95640376** fill as shown below :

Paper Code



Roll No.



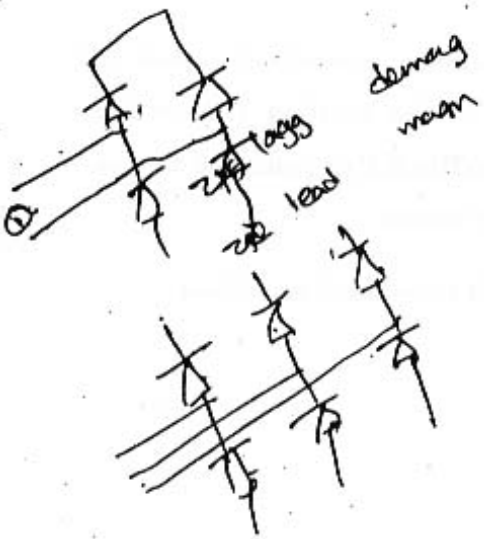
6. Please get the signature of the Invigilator affixed in the space provided in the Answer Sheet. An Answer Sheet without the signature of the Invigilator is liable for ***invalidation***.

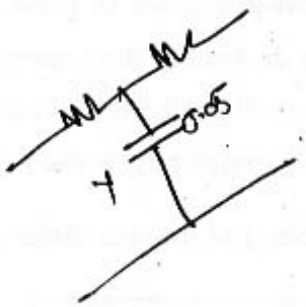
7. The candidate should **not** do rough work or write any irrelevant matter in the Answer Sheet. Doing so will lead to ***invalidation***.

8. Do **not** mark answer choices on the Test Booklet. Violation of this will be viewed seriously.

9. Before leaving the examination hall, the candidate should hand over the original OMR Answer Sheet (top sheet) to the Invigilator and carry the bottom sheet (duplicate) for his/her record, failing which disciplinary action will be taken.

10. Use of whitener is prohibited. If used, the answer sheet is liable for invalidation.





1. Superposition theorem requires as many circuits to be solved as there are

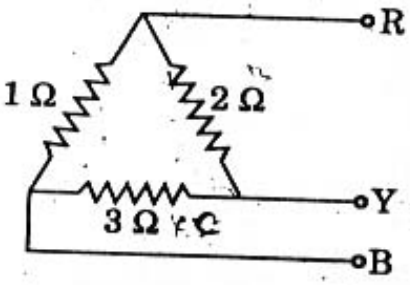
(1) Sources

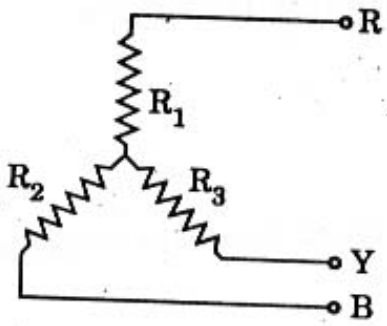
(2) Nodes

(3) Sources + Nodes

(4) Sources + Nodes + Meshes

2. Three resistances of 1 ohm, 2 ohms and 3 ohms are connected in delta. These resistances are to be replaced by star connection as shown in the figure below, maintaining the same terminal conditions :





The value of the highest resistance in star will be

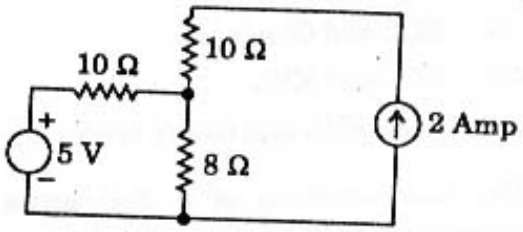
(1) $\frac{1}{4}$ ohm

(2) $\frac{1}{3}$ ohm

(3) $\frac{1}{2}$ ohm

(4) 1 ohm

3. The following theorem is best suited for application to the given circuit below :



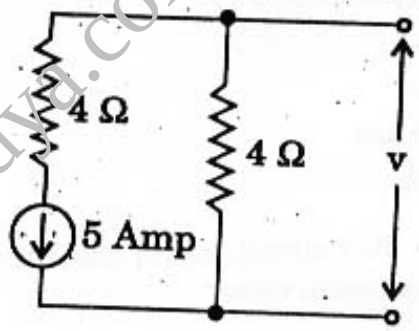
(1) Thevenin's theorem

(2) Norton's theorem

(3) Compensation theorem

(4) Superposition theorem

4. Equivalent Thevenin's voltage source for the voltage source of the given circuit below :



(1) − 20 V, 4 Ω

(2) 20 V, 4 Ω

(3) − 10 V, 2 Ω

(4) 10 V, 2 Ω

5. Which of the following lamps will have the least resistance at room temperature ?

(1) 200 W, 220 V

(2) 100 W, 220 V

(3) 60 W, 220 V

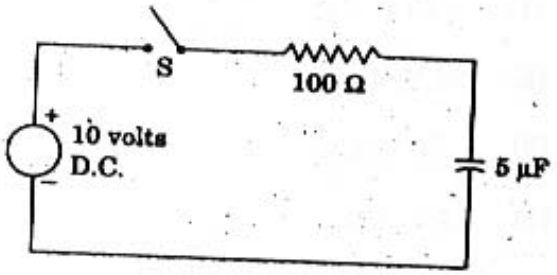
(4) 25 W, 220 V

6. The nodal method of analysis of the circuit is based on
   (1) KVL and Ohm's law
   (2) KCL and Ohm's law
   (3) KCL and KVL
   (4) KCL, KVL and Ohm's law

7. The time constant of a R-C series circuit increases with the
   (1) increase of capacitance and decrease of resistance
   (2) increase of capacitance and increase of resistance
   (3) decrease of capacitance and decrease of resistance
   (4) decrease of capacitance and increase of resistance

8. For electrical appliances, the power rating is determined by
   (1) Current
   (2) Voltage
   (3) Copper loss
   (4) Iron loss

9. In the given R-C circuit below, the current reaches its maximum value :



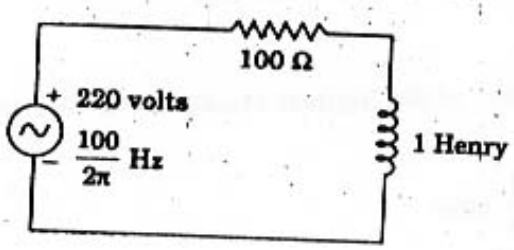
   (1) after 50 μ sec. of turning on the Switch S
   (2) after 100 μ sec. of turning on the Switch S
   (3) after 1000 μ sec. of turning on the Switch S
   (4) immediately after turning on the Switch S

10. In an R-L series circuit excited by a battery, the final value of the current in the circuit does not depend on
   (1) Battery e.m.f.
   (2) Resistance R
   (3) Inductance L
   (4) Battery e.m.f. and Inductance L

11. If f_1 and f_2 are the lower and upper half power frequencies of a RLC series circuit and f_0 is the frequency at resonance, then the selectivity of RLC circuit is given by
   (1) $\frac{f_2 - f_0}{f_1 - f_0}$
   (2) $\frac{f_2 - f_1}{f_0}$
   (3) $\frac{f_2 - f_1}{2f_0}$
   (4) $\frac{f_2 - f_1}{f_1 - f_0}$

12. It is given that $\dot{Z}_1 = (2 + j3)\ \Omega$ and $\dot{Z}_2 = (6 + j3)\ \Omega$. Then $|\dot{Z}_1 + \dot{Z}_2|$ is
   (1) 10 Ω
   (2) 14 Ω
   (3) 11 Ω
   (4) 15 Ω

13. In the given circuit below, the voltage across the inductor is



   (1) $\frac{220}{\sqrt{2}}$ volts
   (2) $220\sqrt{2}$ volts
   (3) 220 volts
   (4) 110 volts

14. At half power frequencies, the current in the series RLC circuit is

(1) $\frac{1}{2}$ × current at resonance

(2) $\frac{1}{\sqrt{2}}$ × current at resonance

(3) $\frac{1}{4}$ × current at resonance

(4) $\frac{1}{\sqrt{3}}$ × current at resonance

15. Two sinusoidal e.m.fs are given as

$e_1 = A \sin\left(\omega t + \frac{\pi}{4}\right)$ and $e_2 = B \sin\left(\omega t - \frac{\pi}{6}\right)$.

The phase difference between the two quantities in degrees is

(1) 15°

(2) 60°

(3) 75°

(4) 105°

16. In two wattmeter method of 3-phase power measurements, when the power factor is 0·5

(1) the readings of the two wattmeters are equal and positive

(2) the readings of the two wattmeters are equal and opposite

(3) the total power is measured by only one wattmeter

(4) the readings of the two wattmeters are not equal and positive

17. The reading of the wattmeter connected to measure the reactive power in a 3-phase circuit is give by zero when the line voltage is 400 volts and the line current is 15 amps. Then the power factor of the circuit is

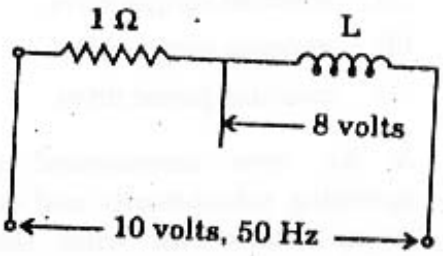
(1) Zero

(2) 0·6

(3) 0·8

(4) unity

18. For the circuit given below, the current through 1 ohm resistor will be



(1) 2 Amps

(2) 4 Amps

(3) 6 Amps

(4) 8 Amps

19. Admittance is the reciprocal of

(1) Impedance

(2) Inductance

(3) Susceptance

(4) Reactance

20. The power expression in 3-phase circuit in terms of line voltage V_L, line current I_L and power factor of the load is $\sqrt{3}\, V_L\, I_L \cos\phi$, where ϕ is the angle between

(1) line voltage and line current

(2) line voltage and phase current

(3) phase voltage and line current

(4) phase voltage and phase current

21. The function of commutator in a d.c. machine is to

(1) improve commutation

(2) change a.c. current to d.c. current

(3) change a.c. voltage to d.c. voltage

(4) provide easy speed control

22. A d.c. machine is fitted with both an Interpole Winding IW and a Compensating Winding CW. With respect to the armature circuit

(1) both IW and CW are in parallel

(2) IW is in series and CW is in parallel

(3) IW is in parallel and CW is in series

(4) both IW and CW are in series

23. Speed control of d.c. motor by the variation of field flux results in

(1) variable power drive

(2) constant torque drive

(3) variable torque drive

(4) constant power drive

24. A d.c. over compounded generator was operating satisfactorily and supplying power to an infinite bus. When the prime mover failed to supply any mechanical power, the machine would then run as a

(1) cumulatively compounded motor with speed reversed

(2) cumulatively compounded motor with direction of rotation as before

(3) differentially compounded motor with speed reversed

(4) differentially compounded motor with direction of rotation as before

25. When load is applied to d.c. shunt motor, which one of the following will happen ?

(1) Speed decreases and back e.m.f. increases

(2) Speed increases and back e.m.f. increases

(3) Speed increases and back e.m.f. decreases

(4) Speed decreases and back e.m.f. decreases

26. Critical resistance of d.c. generator is the resistance of the field winding of a generator

(1) at which it develops maximum voltage

(2) at which it can supply maximum power

(3) beyond which it does not develop any voltage

(4) None of these

27. In Ward – Leonard method of speed control, the minimum number of machines needed is

(1) one

(2) two

(3) three

(4) four

28. Addition of an external resistance in the field of a d.c. shunt generator results in

(1) increase in the voltage of the generator

(2) decrease in the voltage of the generator

(3) increase in the power delivered

(4) increase in the speed of the generator

29. In a d.c. generator, the load current corresponding to maximum efficiency is given by the relation :

(1) $I = \sqrt{\frac{R_a}{W_c}}$

(2) $I = \sqrt{\frac{W_c}{R_a}}$

(3) $I = \sqrt{\frac{W_c + 1}{R_a}}$

(4) $I = \sqrt{\frac{W_c}{R_a + 1}}$

where R_a is the armature resistance and W_c is the constant losses.

30. Lap winding is most suitable for

(1) low voltage and high current machine

(2) high voltage and high current machine

(3) high voltage and low current machine

(4) low voltage and low current machine

31. The efficiency of a transformer at full load 0·8 p.f. lagging is 95%. Its efficiency at full load 0·8 p.f. leading will be

(1) less than 95%

(2) more than 95%

(3) 95%

(4) 100%

32. Single-phase, 1 KVA, 400/200 volts, 50 Hz transformer has its L.V. winding resistance of 0·02 p.u. This resistance when referred to H.V. winding is

(1) 0·01 p.u.

(2) 0·02 p.u.

(3) 0·04 p.u.

(4) 0·08 p.u.

33. A transformer connected to a 400 volts. 50 Hz supply draws a magnetising current of one Ampere. When it is connected to 200 volts, 25 Hz supply, it draws a magnetising current of

(1) 1 Ampere

(2) 2 Amperes

(3) 0·5 Ampere

(4) 0·25 Ampere

34. The most suitable and economical connection for small KVA, high voltage, 3-phase transformer is

(1) Star/Delta connection

(2) Delta/Delta connection

(3) Delta/Star connection

(4) Star/Star connection

35. For successful parallel operation of two single-phase transformers, the essential condition is that their

(1) percentage impedances should be equal

(2) polarities must be properly connected

(3) turns ratios should be exactly equal

(4) KVA ratings should be equal

36. The tertiary winding in a 3-phase transformer is connected in

(1) Star

(2) Double Star

(3) Delta

(4) Zig-Zag

37. The phase sequence RBY denotes that

(1) e.m.f. of phase B lags that of phase R by 120°

(2) e.m.f. of phase B leads that of phase R by 120°

(3) e.m.f. of phase B lags that of phase R by 140°

(4) None of the above

38. A 3-phase transformer connected in Star/Star can be operated most efficiently in parallel with another transformer having a connection of

(1) Star/Delta

(2) Delta/Star

(3) Delta/Delta

(4) Star/Zig-Zag

39. The inrush current of a transformer is maximum when it is switched on at an instant when the voltage is passing through

(1) zero

(2) positive maximum

(3) negative maximum

(4) any value

40. A 3-phase step down transformer with a turns ratio of 12 is connected in mesh/star. If it draws a line current of 100 Amps from the supply, the line current on the secondary side is

(1) $100\sqrt{3}$ Amps

(2) $\frac{100}{\sqrt{3}}$ Amps

(3) $1200\sqrt{3}$ Amps

(4) $\frac{1200}{\sqrt{3}}$ Amps

41. The starting torque of a 3-phase induction motor is maximum when

(1) rotor resistance per phase equals rotor reactance per phase

(2) rotor resistance per phase is twice the rotor reactance per phase

(3) rotor resistance per phase is half the rotor reactance per phase

(4) rotor resistance per phase is $\sqrt{2}$ times the rotor reactance per phase

42. The power factor of star connected induction motor is 0·5. On being connected in delta, the power factor will

(1) become zero

(2) remain the same

(3) reduce

(4) increase

43. In a 3-phase wound rotor induction motor, 3-phase balanced supply is given to the rotor and the stator winding is short circuited. The rotor would

(1) not run

(2) run in the direction of the rotating magnetic field

(3) run against the direction of the rotating magnetic field

(4) run above synchronous speed

44. A starting torque of 100 N-m is developed by an auto-transformer starter with a tapping of 40%. If the tapping of the auto-transformer starter is at 80%, then the starting torque would be

(1) 25 N-m

(2) 50 N-m

(3) 200 N-m

(4) 400 N-m

45. When the resistance of the rotor circuit of a 3-phase slip-ring induction motor is doubled, the maximum torque developed by the machine

(1) increases

(2) decreases

(3) remains unaltered

(4) gets doubled

46. The starting torque developed in a split-phase single-phase induction motor is directly related to the phase angle 'α' between the two winding currents by the relation

(1) $\cos \alpha$

(2) $\sin \alpha$

(3) $\tan \alpha$

(4) $\sin 2\alpha$

47. Cross-field theory is used in the analysis of

(1) d.c. motor

(2) cross-field machine

(3) single-phase induction motor

(4) synchronous motor

48. The direction of rotation of a 1-phase capacitor motor is reversed by

(1) increasing the microfarads of the capacitor

(2) decreasing the microfarads of the capacitor

(3) interchanging the supply terminals of the motor

(4) interchanging the terminals of one of the windings

49. When the rotor of a 3-phase induction motor runs at synchronous speed, the rotor

(1) e.m.f. alone is zero

(2) current alone is zero

(3) torque alone is zero

(4) e.m.f., current and torque are zero

50. Torque developed by 3-phase induction motor equals

(1) copper losses in the rotor

(2) air gap power transferred to the rotor

(3) power input to rotor minus rotor copper losses

(4) power input to the motor

51. The regulation of an alternator assessed by the synchronous impedance method as compared to that obtained by ampere turn method is

(1) low

(2) high

(3) same

(4) sometimes low and sometimes high

52. A synchronous machine is working on an infinite bus bar supplying power at unity power factor to the bus. If the excitation is decreased

(1) the power factor becomes lagging

(2) the power factor becomes leading

(3) the power supplied increases

(4) the power factor remains unaltered

53. The power developed by a cylindrical rotor synchronous machine is maximum when the load angle is

(1) 90°

(2) 60°

(3) 40°

(4) 0°

54. When the excitation of a salient pole synchronous motor working on no load is reduced to zero

(1) it comes to rest

(2) it continues to run at synchronous speed

(3) it runs at a speed slightly less than synchronous speed

(4) it runs at a speed higher than synchronous speed

55. When the speed becomes more than the synchronous speed during hunting, the damper bars develop

(1) synchronous motor torque

(2) d.c. motor torque

(3) induction motor torque

(4) induction generator torque

56. For a certain field excitation, balanced short circuit current of a polyphase alternator is 20 Amperes, when running at a speed of 1000 RPM. For the same field current, the balanced short circuit current when running at 900 RPM would be

(1) about 16 Amperes
(2) more than 20 Amperes
(3) 20 Amperes
(4) 18 Amperes

57. Hunting in synchronous motors occurs due to

(1) changes in excitation
(2) increase in supply for the motor
(3) increase in supply frequency
(4) sudden load variations

58. The diameter of high speed turboalternators as compared to hydroelectric ones are

(1) smaller because speed is less
(2) larger because speed is high
(3) smaller because speed is high
(4) larger because speed is less

59. For zero power factor leading operation of an alternator, the effect of armature reaction on the main flux is

(1) magnetizing only
(2) demagnetizing only
(3) cross-magnetizing only
(4) None of the above

60. In a synchronous motor, if the excitation is reduced from a large value, the armature current decreases and becomes a minimum at a point. At this point, the power factor is

(1) lagging
(2) leading
(3) unity
(4) zero

61. A portable instrument is likely to have

(1) fluid friction damping
(2) pneumatic damping
(3) gravitational damping
(4) eddy current damping

62. The phenomenon of creeping occurs in

(1) Ammeters
(2) Voltmeters
(3) Wattmeters
(4) Watthour meters

63. The scale of a wattmeter gives maximum indication of 100. The current and voltage ranges are 10 Amps and 220 volts. The multiplication factor is

(1) $\frac{100}{10 \times 220}$
(2) $\frac{10 \times 220}{100}$
(3) $\frac{220}{10 \times 100}$
(4) $\frac{100 \times 10}{220}$

64. Frequency compensation in a molding iron instrument is achieved by connecting

(1) a capacitor in series with the fixed coil
(2) a capacitor across the fixed coil
(3) high resistance in series with the coil
(4) low resistance in series with the coil

65. The range of an electrostatic voltmeter can be extended by using

(1) a capacitor in series with the voltmeter whose capacitance is greater than the capacitance of the voltmeter

(2) a capacitor in series with the voltmeter whose capacitance is smaller than the capacitance of the voltmeter

(3) a resistor in series with the voltmeter

(4) an inductor in series with the voltmeter

66. Two strain gauges are used to measure strain in a cantilever. One gauge is mounted on top of the cantilever and the other is placed at the bottom. The two strain gauges form two arms of a voltage sensitive wheatstone bridge. This bridge configuration is called

(1) a quarter bridge

(2) a half bridge

(3) a full bridge

(4) a null bridge

67. In d.c. tachogenerators used for the measurement of speed of a shaft, frequent calibration has to be done because

(1) the contacts wear off

(2) the strength of the permanent magnet decreases with age

(3) the armature current produces heating effects

(4) All of the above

68. A thermocouple

(1) has a low time constant when it is bare

(2) has a low time constant if it is provided with a sheath

(3) has the same time constant whether it is bare or is provided with a sheath

(4) None of the above

69. Which one of the following metals is preferred as a shunt for extending the range of an instrument ?

(1) Copper

(2) Steel

(3) Manganin

(4) Aluminium

70. A DVM has a $4\frac{1}{2}$ digit display. The 1 volt range can read upto

(1) 9999

(2) 9·99

(3) 1·9999

(4) 0·19999

71. In a Zener diode

(1) forward voltage rating is high

(2) negative resistance characteristic exists

(3) sharp breakdown occurs at low reverse voltage

(4) None of the above

72. With which of the following can the intrinsic semiconductor silicon be doped in order to obtain p-type silicon ?

(1) Boron

(2) Phosphorus

(3) Gallium

(4) Arsenic

73. The leakage current in CE configuration may be around

(1) few nanoamperes

(2) few microamperes

(3) few hundred microamperes

(4) few milliamperes

74. The following amplifier configuration yields the largest power gain of all transistor amplifier configurations :

(1) Common base

(2) Common emitter

(3) Common collector

(4) Emitter follower

75. If the operating point of an NPN transistor amplifier is selected in saturation region, it is likely to result in

(1) thermal runaway of transistor

(2) clipping of output in the positive half of the input signal

(3) need for high d.c. collector supply

(4) clipping of output in the negative half of the input signal

76. A half-wave rectified sinusoidal waveform has a peak voltage of 10 volts. Its average value and the RMS value of the fundamental components are respectively given by

(1) $\frac{20}{\pi}$ volts, $\frac{10}{\sqrt{2}}$ volts

(2) $\frac{16}{\pi}$ volts, $\frac{10}{\sqrt{2}}$ volts

(3) $\frac{10}{\pi}$ volts, 5 volts

(4) $\frac{20}{\pi}$ volts, 5 volts

77. A TRIAC is a

(1) 2 terminal switch

(2) 2 terminal bilateral switch

(3) 3 terminal unilateral switch

(4) 3 terminal bidirectional switch

78. In single-phase full wave controlled bridge rectifier, minimum output voltage is obtained at conduction angle _____ and maximum at conduction angle _____ .

(1) 0°, 180°

(2) 180°, 0°

(3) 0°, 0°

(4) 180°, 180°

79. Comparing a Triac and SCR

(1) both are unidirectional devices

(2) Triac requires more current for turn on than SCR at a particular voltage

(3) a Triac has more time for turn off than SCR

(4) both are bidirectional devices

80. In single-phase to single-phase cycloconverter of mid-point type, 4 thyristors are required. For 3-phase to 3-phase similar cycloconverter, the number of thyristors required is

(1) 6

(2) 12

(3) 18

(4) 36

81. The curve plotting discharge in m^3/second against time t in hours is known as

(1) flow histogram

(2) discharge duration curve

(3) hydrograph

(4) load curve

82. Induced draught fan used in steam power plant serves to create draught

(1) in the boiler

(2) in the chimney

(3) at the inlet of air preheater

(4) in the cooling tower

83. Impedance relay can be used for

(1) phase faults only

(2) earth faults only

(3) both phase and earth faults

(4) None of the above

84. Compared with normal impedance, the fault impedance of a circuit is

(1) the same

(2) higher

(3) lower

(4) may be lower or higher

85. The basic quantity measured in a distance relay is

(1) impedance difference

(2) voltage difference

(3) current difference

(4) None of the above

86. Water hammer is developed in

(1) penstock

(2) surge tank

(3) turbine

(4) alternator

87. The function of moderator in a nuclear reactor is to

(1) start chain reaction

(2) stop chain reaction

(3) control the reaction

(4) transfer heat produced inside the reactor to heat exchanger

88. A system has connected load of 120 kW, peak load of 100 kW, base load of 25 kW and average load of 48 kW. The load factor of the consumer is

(1) 40%

(2) 48%

(3) 25%

(4) 83·3%

89. Demand factor on a power system is

(1) always greater than unity

(2) normally greater than unity

(3) always lesser than unity

(4) normally lesser than unity

90. Earth fault relays are

(1) directional relays

(2) non-directional relays

(3) short operate time relays

(4) None of the above

91. The power factor of receiving end of transmission line is _____ the power factor of sending end.
(1) equal to
(2) not related to
(3) less than
(4) more than

92. Power loss is the criteria to design
(1) alternator
(2) transformer
(3) transmission line
(4) distribution lines

93. The voltage regulation R of a transmission line of voltage V is
(1) $R \propto V$
(2) $R \propto \frac{1}{V}$
(3) $R \propto V^2$
(4) $R \propto \frac{1}{V^2}$

94. The characteristic impedance of transmission line in terms of its A, B, C, D parameters may be expressed as
(1) $Z_c = \sqrt{\frac{AB}{CD}}$
(2) $Z_c = \sqrt{\frac{CD}{AB}}$
(3) $Z_c = \sqrt{AB - DC}$
(4) $Z_c = \sqrt{AD - BC}$

95. Surge impedance of 400 Ω means
(1) open circuit impedance of 400 Ω
(2) line can be theoretically loaded upto 400 Ω
(3) line can be practically loaded upto 400 Ω
(4) short-circuit impedance of 400 Ω

96. Corona always causes
(1) system faults
(2) radio interference
(3) insulation failure
(4) None of the above

97. Corona loss is maximum in
(1) ACSR
(2) stranded wire
(3) unstranded wire
(4) transposed wire

98. Proximity effect is due to current flowing in the
(1) earth
(2) sheath
(3) neighbouring conductor
(4) All of these

99. A short transmission line has equivalent circuit consisting of
(1) series resistance R and series inductance L
(2) series resistance R and shunt capacitance C
(3) series resistance R and shunt conductance G
(4) series inductance L and shunt capacitance C

100. In nominal T equivalent of a transmission line, series impedance is (25 + j30) Ω and a shunt capacitance of 0·007 mho. The value of its constant C will be
(1) 25
(2) 30
(3) $\frac{1}{25 + j30}$
(4) 0·007

101. Transmission efficiency of a transmission line increases with the
(1) decrease in power factor and voltage
(2) increase in power factor and voltage
(3) increase in power factor but decrease in voltage
(4) increase in voltage but decrease in power factor

102. The phenomenon of rise in receiving end voltage of the open circuited or lightly loaded line is called the
(1) Proximity effect
(2) Skin effect
(3) Ferranti effect
(4) Seebeck effect

103. For a medium length transmission line, A is
(1) equal to B
(2) equal to C
(3) equal to D
(4) not equal to any of the above

104. The A, B, C, D constants of a 3-phase transposed transmission line with linear and passive elements
(1) are always equal
(2) never equal
(3) A and D are equal
(4) B and C are equal

105. The square root of the ratio of line impedance and shunt admittance is known as the
(1) line surge impedance
(2) line conductance
(3) line susceptance
(4) line regulation

106. Under no load conditions, the current in a transmission line is due to
(1) corona effects
(2) capacitance of the line
(3) back flow from earth
(4) spinning reserve

107. The advantages of d.c. transmission system over a.c. transmission system are
(1) d.c system is economical only
(2) there is no skin effect in d.c. system only
(3) corona limits are highest for the d.c. system as compared to a.c. system only
(4) All of the above

108. In medium transmission lines, the shunt capacitance is taken into account in
(1) Thee method only
(2) Pie method only
(3) Steinmetz method only
(4) All of the above

109. Charging current in transmission line
(1) increases the line losses
(2) decreases the line losses
(3) does not affect the line losses
(4) may increase or decrease the line losses

110. Shunt conductance in power transmission lines is due to leakage over
(1) insulators
(2) conductors
(3) poles
(4) jumpers

111. Which of the following distribution systems is preferred for good efficiency and high economy ?
(1) Single-phase, 2-wire system
(2) 2-phase, 3-wire system
(3) 3-phase, 3-wire system
(4) 3-phase, 4-wire system

112. Steel poles need galvanizing for longer life. Galvanizing is the process of applying a layer of
(1) zinc
(2) paint
(3) varnish
(4) tarcoal

113. Which of the following d.c. distribution systems is most reliable ?
(1) Radial
(2) Ring main
(3) Tree
(4) All are equally reliable

114. The distributors in residential areas are
(1) single-phase, 2-wire
(2) three-phase, 3-wire
(3) three-phase, 4-wire
(4) two-phase, 4-wire

115. A uniformly loaded d.c. distributor is fed at both ends with equal voltages. In comparison to a similar distributor fed at one end only, the maximum voltage drop will be
(1) one-sixth
(2) one-fourth
(3) one-third
(4) one-half

116. A uniformly loaded d.c. distributor is fed at both ends with equal voltages. In comparison to a similar distributor fed at one end only, the drop at the midpoint will be
(1) one-sixth
(2) one-fourth
(3) one-third
(4) one-half

117. In a d.c. 3-wire distribution system, balancer fields are cross-connected in order to
(1) equalize voltages one positive and negative outers
(2) boost the generated voltage
(3) make both machines operated as unloaded motors
(4) All of the above

118. The top-most wire in a distribution line is
(1) neutral wire
(2) earth wire
(3) phase wire
(4) any one of these

119. When the voltage of a distributor increases by 'n' times, its conductor size increases by
(1) n times
(2) n^2 times
(3) $\frac{1}{n}$ times
(4) $\frac{1}{n^2}$ times

120. When the voltage of a feeder is increased by 'n' times, its conductor size increases by
(1) n times
(2) n^2 times
(3) $\frac{1}{n}$ times
(4) $\frac{1}{n^2}$ times

121. (i) Feeders are conductors of large current carrying capacity carrying bulk current to feeding points.

(ii) Distributors are conductors from which current is tapped.

Both the statements are respectively :

(1) false, false
(2) false, true
(3) true, true
(4) true, false

122. One lumen per square metre is the same as

(1) one lux
(2) one candela
(3) one foot candle
(4) one lumen metre

123. The source of illumination for a cinema projector is

(1) Incandescent lamp
(2) Mercury vapour lamp
(3) Sodium lamp
(4) Carbon arc lamp

124. Under the influence of fluorescent lamps, sometimes the wheels of rotating machinery appear to be stationary. This is due to the

(1) fluctuations
(2) luminescence effect
(3) stroboscopic effect
(4) low power factor

125. The choking coil of an operating fluorescent lamp is short-circuited. The consequence is

(1) the fluorescent lamp goes out immediately
(2) the lamp becomes brighter
(3) the lamp becomes less bright
(4) the current becomes so large that it damages the fluorescent lamp

126. In induction heating, the depth upto which the current will penetrate is proportional to

(1) frequency
(2) $(\text{frequency})^2$
(3) $1/(\text{frequency})$
(4) $1/\sqrt{\text{frequency}}$

127. Highest power factor can be expected in which method of heating ?

(1) Electric arc heating
(2) Dielectric heating
(3) Induction heating
(4) Resistance heating

128. Furnaces used for cremation use are of

(1) Resistance heating
(2) Induction heating
(3) Dielectric heating
(4) Arc heating

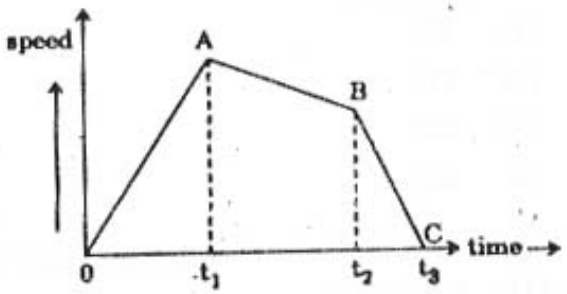
129. Which of the following types of heating processes is used for surface hardening of steel ?

(1) Dielectric heating
(2) Infra-red heating
(3) Induction heating
(4) Resistance heating

130. In dielectric heating, non-uniform heating

(1) occurs for higher frequencies
(2) occurs for lower frequencies
(3) is independent of frequency
(4) occurs for higher power factors

131. The speed-time curve for a suburban train is shown below. In this, AB represents



(1) Regeneration
(2) Braking
(3) Coasting
(4) Acceleration

132. The co-efficient of adhesion is highest when
(1) the rails are dry
(2) the rails are oiled
(3) the rails are wet with dew
(4) the rails are dusty

133. When the speed of the train is estimated taking into account the time of stop at a station in addition to the actual running time between stops, it is known as
(1) Average speed
(2) Schedule speed
(3) Notching speed
(4) Free running speed

134. Area under the speed-time curve represents
(1) net acceleration
(2) distance travelled
(3) average speed
(4) average acceleration

135. The specific energy consumption of the locomotive is governed by
(1) gradient
(2) distance between stops
(3) retardation and acceleration values
(4) All of the above

136. In which service of railways, is the specific energy consumption lowest ?
(1) Main-line service
(2) Urban service
(3) Sub-urban service
(4) Equal for all types of services

137. The braking torque produced during dynamic braking of d.c. traction motor for flux Φ and speed N is proportional to
(1) Φ
(2) ΦN
(3) $\Phi^2 N$
(4) $\Phi(1 + N)$

138. For regenerative braking of d.c. series traction motor, its field windings are
(1) series excited
(2) shunt excited
(3) separately excited
(4) both series and shunt excited

139. The advantage of electric braking is
(1) it is instantaneous
(2) more heat is generated during braking
(3) it avoids wear of track
(4) motor continues to remain loaded during braking

140. To save the energy during braking
(1) dynamic braking is used
(2) plugging is used
(3) regenerative braking is used
(4) mechanical braking is used

141. NAND and NOR gates are called "universal" gates primarily because they
(1) are available everywhere
(2) are widely used in I.C. packages
(3) can be combined to produce AND, OR and NOR gates
(4) are the easiest to manufacture

142. The following truth table corresponds to

I/P	O/P
A_n	Q_{nel}
0	0
1	1

(1) J-K flip-flop
(2) S-R flip-flop
(3) D flip-flop
(4) T flip-flop

143. For designing a binary counter, the preferred type of flip-flop is
(1) D-type
(2) S-R type
(3) Latch
(4) J-K type

144. For the octal number 66·3, the equivalent binary number is
(1) 110110·011
(2) 110110·101
(3) 110111·101
(4) 110110·001

145. The decimal equivalent of the hexadecimal number E5 is
(1) 327
(2) 279
(3) 229
(4) 227

146. The Boolean function for the AND gate is
(1) A + B = Y
(2) A – B = Y
(3) A * B = Y
(4) $A + \overline{A}$

147. The number of full-adders in a 4-bit parallel adder will be
(1) two
(2) three
(3) four
(4) five

148. A half adder includes
(1) a NAND gate with OR gate
(2) a AND gate with XOR gate
(3) only AND gate
(4) neither OR nor XOR nor AND gate

149. The Boolean expression
$A\ \overline{B}\ \overline{C} + \overline{A}\ \overline{B}\ \overline{C} + \overline{A}\ B\ \overline{C} + \overline{A}\ \overline{B}\ C$
is equal to
(1) BC + AC + AB
(2) $BCA + \overline{A}\ \overline{B}\ \overline{C}$
(3) $BC + \overline{A}$
(4) $\overline{B}\ \overline{C} + \overline{A}\ \overline{C} + \overline{A}\ \overline{B}$

150. With a JK master slave flip-flop, the master is clocked when the clock is
(1) low
(2) high
(3) either low or high
(4) constant