

EA/633

2012

Series

B

**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

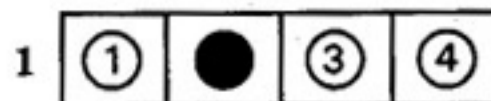
If your Test Booklet Series is A, please fill as shown below :



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 :



EA/633

(3)

B

1. 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
2. Power loss is the criteria to design
- (1) alternator
 - (2) transformer
 - (3) transmission line
 - (4) distribution lines
3. 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) $R \propto \frac{1}{V^2}$
4. 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) $Z_c = \sqrt{AD - BC}$
5. 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
6. Corona always causes
- (1) system faults
 - (2) radio interference
 - (3) insulation failure
 - (4) None of the above
7. Corona loss is maximum in
- (1) ACSR
 - (2) stranded wire
 - (3) unstranded wire
 - (4) transposed wire
8. Proximity effect is due to current flowing in the
- (1) earth
 - (2) sheath
 - (3) neighbouring conductor
 - (4) All of these
9. 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
10. In nominal T equivalent of a transmission line, series impedance is $(25 + j30) \Omega$ 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

EA/633

(4)

B

11. 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
12. 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
13. 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
14. 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
15. 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
16. 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
17. 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
18. 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
19. 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
20. Shunt conductance in power transmission lines is due to leakage over
- (1) insulators
 - (2) conductors
 - (3) poles
 - (4) jumpers

EA/633

(5)

B

21. ✓ 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
22. ✓ Steel poles need galvanizing for longer life. Galvanizing is the process of applying a layer of
- (1) zinc
 - (2) paint
 - (3) varnish
 - (4) tarcoal
23. ✓ Which of the following d.c. distribution systems is most reliable ?
- (1) Radial
 - (2) Ring main
 - (3) Tree
 - (4) All are equally reliable
24. ✓ 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
25. ✓ 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
26. ✓ 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
27. ✓ 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
28. ✓ The top-most wire in a distribution line is
- (1) neutral wire
 - (2) earth wire
 - (3) phase wire
 - (4) any one of these
29. ✓ 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
30. ✓ 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

EA/633

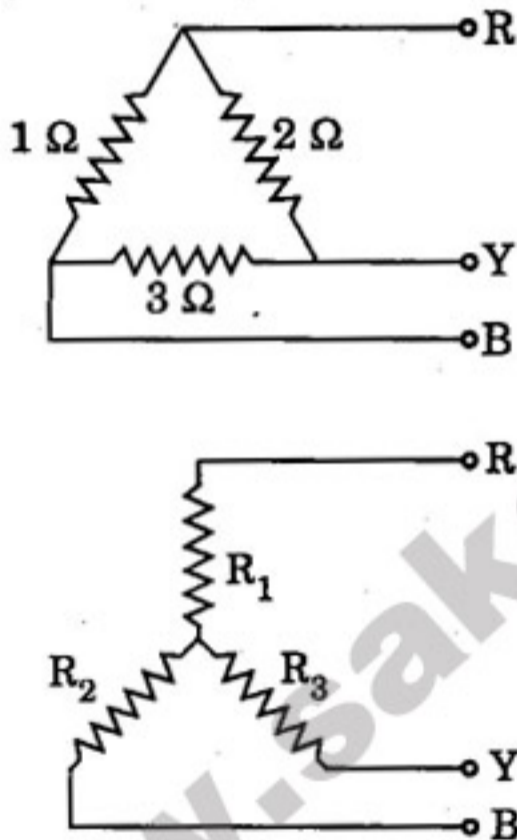
(6)

B

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

- (1) Sources
- (2) Nodes
- (3) Sources + Nodes
- (4) Sources + Nodes + Meshes

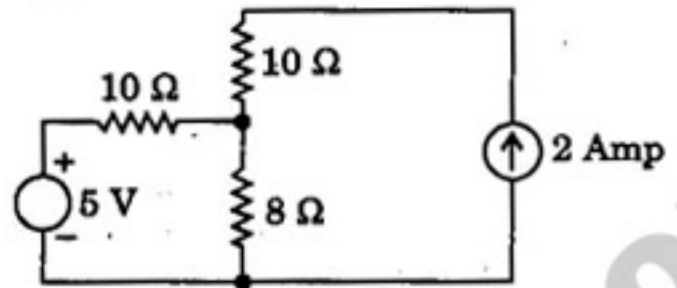
32. Three resistances of 1 ohm, 2 ohms and 3 ohms are connected in delta. These resistances are to be replaced by star connection as shown in the figure below, maintaining the same terminal conditions :



The value of the highest resistance in star will be

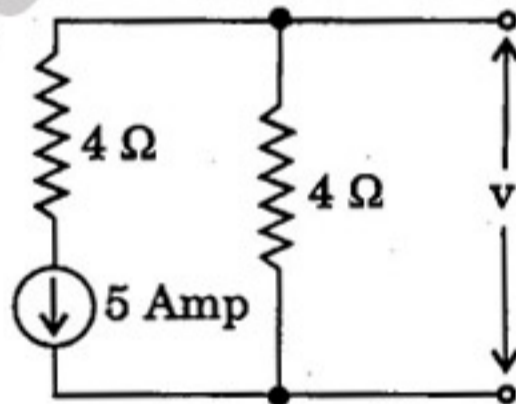
- (1) $\frac{1}{4}$ ohm
- (2) $\frac{1}{3}$ ohm
- (3) $\frac{1}{2}$ ohm
- (4) 1 ohm

33. 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

34. 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

35. 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

36. 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

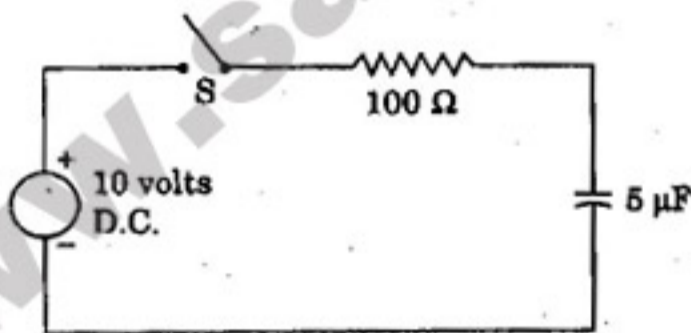
37. The time constant of a R-C series circuit increases with the

- (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

38. For electrical appliances, the power rating is determined by

- (1) Current
- (2) Voltage
- (3) Copper loss
- (4) Iron loss

39. 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

40. 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

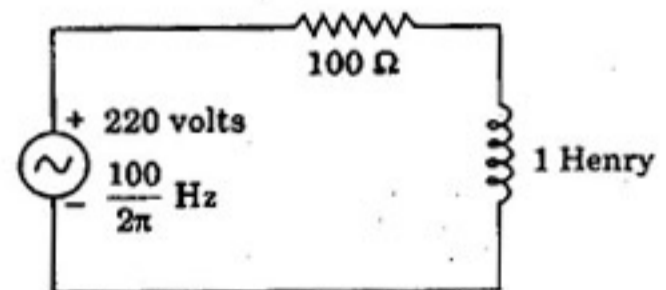
41. If f_1 and f_2 are the lower and upper half power frequencies of a RLC series circuit and f_0 is the frequency at resonance, then the selectivity of RLC circuit is given by

- (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) $\frac{f_2 - f_1}{f_1 - f_0}$

42. 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

43. 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

EA/633

(8)

B

44. 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

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

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

The phase difference between the two quantities in degrees is

- (1) 15°
- (2) 60°
- (3) 75°
- (4) 105°

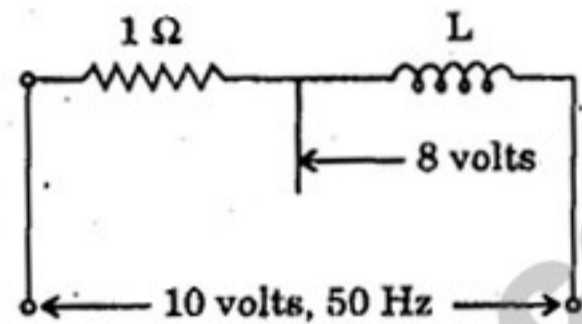
46. In two wattmeter method of 3-phase power measurements, when the power factor is 0.5

- (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

47. 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

48. 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

49. Admittance is the reciprocal of

- (1) Impedance
- (2) Inductance
- (3) Susceptance
- (4) Reactance

50. 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

51. 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

52. 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

- 53✓ 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
- 54✓ 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
- 55✓ 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
- 56✓ 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
- 57✓ In Ward - Leonard method of speed control, the minimum number of machines needed is
- (1) one
 - (2) two
 - (3) three
 - (4) four
- 58✓ 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
- 59✓ 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.
- 60✓ 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

EA/633

(10)

B

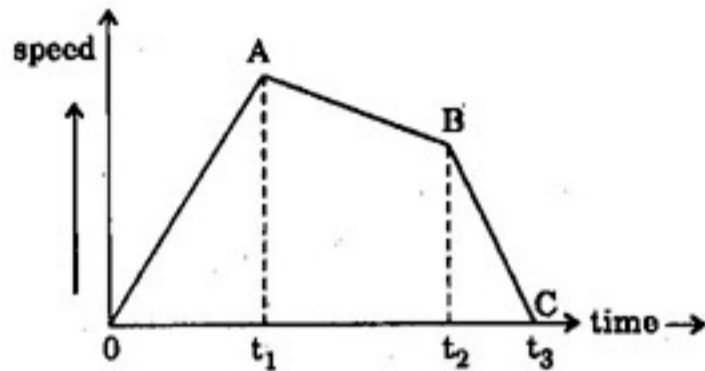
61. (i) Feeders are conductors of large current carrying capacity carrying bulk current to feeding points.
 (ii) Distributors are conductors from which current is tapped.
 Both the statements are respectively :
- (1) false, false
 - (2) false, true
 - (3) true, true
 - (4) true, false
62. One lumen per square metre is the same as
- (1) one lux
 - (2) one candela
 - (3) one foot candle
 - (4) one lumen metre
63. The source of illumination for a cinema projector is
- (1) Incandescent lamp
 - (2) Mercury vapour lamp
 - (3) Sodium lamp
 - (4) Carbon arc lamp
64. 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
65. 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
66. In induction heating, the depth upto which the current will penetrate is proportional to
- (1) frequency
 - (2) (frequency)²
 - (3) 1/(frequency)
 - (4) $1/\sqrt{\text{frequency}}$
67. Highest power factor can be expected in which method of heating ?
- (1) Electric arc heating
 - (2) Dielectric heating
 - (3) Induction heating
 - (4) Resistance heating
68. Furnaces used for cremation use are of
- (1) Resistance heating
 - (2) Induction heating
 - (3) Dielectric heating
 - (4) Arc heating
69. 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
70. 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

EA/633

(11)

B

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



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

72. 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

73. 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

74. Area under the speed-time curve represents

- (1) net acceleration
- (2) distance travelled
- (3) average speed
- (4) average acceleration

75. 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

76. 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

77. 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) $\Phi(1 + N)$

78. 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

79. 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

80. ✓ 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

81. ✓ 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

82. ✓ 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

83. ✓ 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

84. ✓ For the octal number 66·3, the equivalent binary number is

- (1) 110110·011
- (2) 110110·101
- (3) 110111·101
- (4) 110110·001

85. ✓ The decimal equivalent of the hexadecimal number E5 is

- (1) 327
- (2) 279
- (3) 229
- (4) 227

86. ✓ The Boolean function for the AND gate is

- (1) $A + B = Y$
- (2) $A - B = Y$
- (3) $A * B = Y$
- (4) $A + \bar{A}$

87. ✓ The number of full-adders in a 4-bit parallel adder will be

- (1) two
- (2) three
- (3) four
- (4) five

88. ✓ 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

89. ✓ The Boolean expression

$$A \bar{B} \bar{C} + \bar{A} \bar{B} \bar{C} + \bar{A} B \bar{C} + \bar{A} \bar{B} C$$

is equal to

- (1) $BC + AC + AB$
- (2) $BCA + \bar{A} \bar{B} \bar{C}$
- (3) $BC + \bar{A}$
- (4) $\bar{B} \bar{C} + \bar{A} \bar{C} + \bar{A} \bar{B}$

90. ✓ 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

EA/633

(13)

B

91. A portable instrument is likely to have

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

92. The phenomenon of creeping occurs in

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

93. 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) $\frac{100 \times 10}{220}$

94. 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

95. 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

96. 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

97. 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

98. 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

99. 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
100. 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
101. 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
102. 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
103. The leakage current in CE configuration may be around
- (1) few nanoamperes
 - (2) few microamperes
 - (3) few hundred microamperes
 - (4) few milliamperes
104. 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
105. 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
106. 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
107. A TRIAC is a
- (1) 2 terminal switch
 - (2) 2 terminal bilateral switch
 - (3) 3 terminal unilateral switch
 - (4) 3 terminal bidirectional switch

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

- (1) $0^\circ, 180^\circ$
- (2) $180^\circ, 0^\circ$
- (3) $0^\circ, 0^\circ$
- (4) $180^\circ, 180^\circ$

✓109. 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

✓110. 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

✓111. 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

✓112. 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

✓113. 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

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

- (1) the same
- (2) higher
- (3) lower
- (4) may be lower or higher

✓115. The basic quantity measured in a distance relay is

- (1) impedance difference
- (2) voltage difference
- (3) current difference
- (4) None of the above

✓116. Water hammer is developed in

- (1) penstock
- (2) surge tank
- (3) turbine
- (4) alternator

117. 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
118. 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%
119. 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
120. Earth fault relays are
- (1) directional relays
 - (2) non-directional relays
 - (3) short operate time relays
 - (4) None of the above
121. 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%
122. 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.
123. 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
124. 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

EA/633

(17)

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125. 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
126. The tertiary winding in a 3-phase transformer is connected in
- (1) Star
 - (2) Double Star
 - (3) Delta
 - (4) Zig-Zag
127. The phase sequence RBY denotes that
- (1) c.m.f. of phase B lags that of phase R by 120°
 - (2) c.m.f. of phase B leads that of phase R by 120°
 - (3) c.m.f. of phase B lags that of phase R by 140°
 - (4) None of the above
128. 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
129. 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
130. 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
131. 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
132. 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

133. 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
134. 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
135. 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
136. 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) $\sin 2\alpha$
137. 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
138. 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
139. 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
140. 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
141. 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

142. 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
143. The power developed by a cylindrical rotor synchronous machine is maximum when the load angle is
- (1) 90°
 - (2) 60°
 - (3) 40°
 - (4) 0°
144. 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
145. 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
146. 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
147. 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
148. 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
149. 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
150. 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