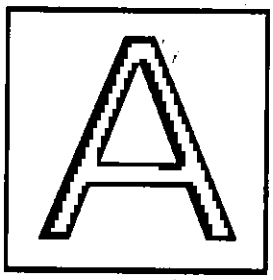
ES Exam-2012

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T.B.C. : R-FTF-M-FFB **Test Booklet Series**

Serial [ ]



TEST BOOKLET

ELECTRICAL ENGINEERING

Paper II

Time Allowed : Two Hours ***Maximum Marks : 200***

INSTRUCTIONS

1. IMMEDIATELY AFTER THE COMMENCEMENT OF THE EXAMINATION, YOU SHOULD CHECK THAT THIS TEST BOOKLET DOES *NOT* HAVE ANY UNPRINTED OR TORN OR MISSING PAGES OR ITEMS, ETC. IF SO, GET IT REPLACED BY A COMPLETE TEST BOOKLET.
2. ENCODE CLEARLY THE TEST BOOKLET SERIES **A, B, C,** OR **D** AS THE CASE MAY BE IN THE APPROPRIATE PLACE IN THE ANSWER SHEET.
3. You have to enter your Roll Number on the Test Booklet in the Box provided alongside. ***DO NOT*** write ***anything else*** on the Test Booklet.
4. This Test Booklet contains **120** items (questions). Each item comprises four responses (answers). You will select the response which you want to mark on the Answer Sheet. In case you feel that there is more than one correct response, mark the response which you consider the best. In any case, choose ***ONLY ONE*** response for each item.
5. You have to mark all your responses ***ONLY*** on the separate Answer Sheet provided. See directions in the Answer Sheet.
6. All items carry equal marks.
7. Before you proceed to mark in the Answer Sheet the response to various items in the Test Booklet, you have to fill in some particulars in the Answer Sheet as per instructions sent to you with your Admission Certificate.
8. After you have completed filling in all your responses on the Answer Sheet and the examination has concluded, you should hand over to the Invigilator ***only the Answer Sheet.*** You are permitted to take away with you the Test Booklet.
9. Sheets for rough work are appended in the Test Booklet at the end.
10. **Penalty for wrong answers :**

    THERE WILL BE PENALTY FOR WRONG ANSWERS MARKED BY A CANDIDATE IN THE OBJECTIVE TYPE QUESTION PAPERS.

    (i) There are four alternatives for the answer to every question. For each question for which a wrong answer has been given by the candidate, **one-third (0·33)** of the marks assigned to that question will be deducted as penalty.

    (ii) If a candidate gives more than one answer, it will be treated as a **wrong answer** even if one of the given answers happens to be correct and there will be same penalty as above to that question.

    (iii) If a question is left blank, i.e., no answer is given by the candidate, there will be **no penalty** for that question.

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1. A 200 V/100 V, 50 Hz transformer is to be excited at 40 Hz from 100 V side. For the exciting current to be the same, the applied voltage should be

(a) 150 V

(b) 80 V

(c) 100 V

(d) 125 V

2. Match List I with List II and select the correct answer using the code given below the lists :

List I	*List II*
A. Magnetic flux	1. Resistance
B. Magneto motive force	2. Electric current
C. Reluctance	3. Conductivity
D. Permeability	4. Electromotive force

Code :

	A	B	C	D
(a)	2	1	4	3
(b)	3	1	4	2
(c)	2	4	1	3
(d)	3	4	1	2

3. A 10 kVA, 2200/220 V transformer gave the following test results : Open-circuit test, High-voltage side open : V = 220 V, I = 1·5 A, W = 150 W. Short-circuit test, Low voltage side short-circuited : V = 115 V, I = rated, W = 200 W. The half full-load efficiency of the transformer operating at unity power factor is

(a) 95%

(b) 95·5%

(c) 96%

(d) 96·5%

4. Consider the following statements :

The open-circuit test in a transformer can be used to obtain

1. Core losses.
2. Magnitude of exciting current.
3. Copper losses.
4. Equivalent series impedance.

Correct statements are

(a) 1, 2, 3 and 4

(b) 1 and 3 only

(c) 1 and 2 only

(d) 2 and 4 only

5. A 100 kVA, 2400 V/ 240 V, 50 Hz single phase transformer has an exciting current of 0·64 A and core loss 700 W when its high voltage side is energized at rated voltage and frequency. If load current is 40 A at 0·8 PF lagging on the LV side, then magnitude of the primary current will be

(a) 4·58 A

(b) 4 A

(c) 4·64 A

(d) 4·85 A

6. In which one of the following sets of 3-phase transformer connections will zero sequence current be present in the transformer windings ?

(a) Primary in star, neutral grounded; secondary in star, neutral not grounded

(b) Primary in star, neutral grounded; secondary in delta

(c) Primary in star, neutral not grounded; secondary in star, neutral grounded

(d) Primary in star, neutral not grounded; secondary in delta

7. The air-gap between the yoke and armature in a dc motor is kept small

(a) To achieve a stronger magnetic field

(b) To avoid overheating of the machine

(c) To avoid locking of the armature

(d) To avoid transverse motion

8. In a dc machine running with a heavy load, and with the brushes located on the geometrical neutral axis, sparking occurs at the brushes during commutation, because of

(a) The high current-density at the coil-ends

(b) The centrifugal force exerted on the brushes by the commutator

(c) The shifting of the magnetic neutral axis

(d) The reduced main-field flux-density in the inter-polar regions

9. The speed of a dc motor is related to the back emf and flux in the following ways :

(a) Directly proportional to flux and inversely proportional to back emf

(b) Directly proportional to back emf and inversely proportional to flux

(c) Inversely proportional to flux and inversely proportional to back emf

(d) Directly proportional to flux and directly proportional to back emf

10. A 4-pole dc generator is running at 1500 rpm. The frequency of current in the armature winding is

(a) 50 Hz

(b) 150 Hz

(c) 25 Hz

(d) 100 Hz

11. A separately excited dc generator is feeding a dc shunt motor. If the load torque on the motor is reduced to half, then

(a) The armature current of both motor and generator are reduced to half

(b) The armature current of motor is halved and that of generator remains unchanged

(c) The armature current of generator is halved and that of motor remains unchanged

(d) The armature current of both machines remains unchanged

12. A dc series motor is running at rated speed and rated voltage, feeding a constant power load. If the speed has to be reduced to 0·25 pu, the supply voltage should be reduced to

(a) 0·75 pu

(b) 0·5 pu

(c) 0·25 pu

(d) 0·075 pu

13. The overall efficiency of a dc shunt generator is maximum when its variable loss equals

(a) The stray loss

(b) The iron loss

(c) Constant loss

(d) Mechanical loss

14. A Pelton wheel turbine having a rated speed of 300 rpm is connected to an alternator to produce power at 50 Hz. The number of poles required in the alternator is

(a) 4

(b) 8

(c) 10

(d) 20

15. A 500 MW, 13·8 kV star connected synchronous generator at 0·8 PF will deliver a full load current of

(a) 12·1 kA

(b) 21·0 kA

(c) 26·15 kA

(d) 46·5 kA

16. A synchronous generator has its effective internal impedance Z_s = 10 Ω and resistance r_a = 1·0 Ω. Its generated voltage E_f and terminal voltage V_t are both 500 V. The maximum power output is

(a) 5000 W

(b) 4550 W

(c) 3000 W

(d) 2250 W

17. Consider the following statements with regard to synchronous machines :

1. When a synchronous motor is over-excited, its back emf is greater than the supply voltage.

2. When a synchronous motor is over-excited, its power factor is leading.

3. Synchronous motor is used as a capacitor where load is so large that construction of a static capacitor is impractical.

Correct statements are

(a) 1 and 2 only

(b) 1 and 3 only

(c) 2 and 3 only

(d) 1, 2 and 3

18. A large synchronous generator is feeding power into an infinite bus at slightly lagging power factor. If a total loss of field occurs and the system can supply sufficient reactive power without a large terminal voltage drop, the unit will

(a) Continue to run as a synchronous generator and no tripping is necessary

(b) Get short-circuited and it should be tripped instantaneously

(c) Run as an induction generator and it should be tripped after a time delay

(d) Run as a synchronous motor and it should be tripped after a time delay

19. The rotor frequency of a 3-phase, 5 kW, 400 V, 50 Hz, 4-pole slip ring induction motor is 25 Hz. The speed of the motor when connected to a 400 volt, 50 Hz supply will be

(a) 1500 rpm

(b) 1000 rpm

(c) 750 rpm

(d) Zero

20. A 15 kW, 400 V, 4-pole, 50 Hz, star-connected 3-phase induction motor has full load slip of 4%. The output torque of the machine at full load is

(a) 1·66 Nm

(b) 95·5 Nm

(c) 99·47 Nm

(d) 624·73 Nm

21. In an interconnected power system, the most suitable power plant to meet the peak load conditions is

(a) Hydel

(b) Nuclear

(c) Steam

(d) Pumped storage

22. The utilizable water from a catchment is 60×10^6 cu m annually and the hydro-station has head of 40 m. Assuming ideal generator and turbine, the power that can be theoretically generated is

(a) 250 kW

(b) 300 kW

(c) 500 kW

(d) 750 kW

23. Match List I with List II and select the correct answer using the code given below the lists :

List I	*List II*
A. Moderator	1. Boron
B. Control rod	2. Concrete
C. Coolant	3. Graphite
D. Shield	4. Sodium

Code :

	A	B	C	D
(a)	3	1	4	2
(b)	2	1	4	3
(c)	3	4	1	2
(d)	2	4	1	3

24. A synchronous generator connected to an infinite bus is supplying electrical power at unity power factor to the bus. If the field current is increased

(a) Both the active and reactive power output of the machine will remain unchanged

(b) The active power of the machine will remain unchanged but the machine will also supply lagging reactive power

(c) The active power output of the machine will increase and the machine will draw leading reactive power from the bus

(d) The active power output of the machine will remain unchanged but the machine will also supply leading reactive power

25. The following is ***not*** an advantage of dc transmission :

(a) No charging current

(b) No skin effect

(c) No stability problem

(d) Cheap converters

26. Power transmission lines are transposed to reduce

(a) Skin effect

(b) Ferranti effect

(c) Transmission loss

(d) Interference with neighbouring communication lines

27. Reactive power compensation is applied at midpoint of an EHV line of total reactance 0·2 pu so as to maintain the voltage there at 0·98 pu. The voltage at both ends of the line is $1 \angle 0°$ pu. The steady state power transfer limit, in pu, is

(a) 2·45

(b) 5

(c) 9·8

(d) 19·6

28. In Gauss-Seidel load flow method, the number of iterations may be reduced if the correction in voltage at each bus is multiplied by

(a) Gauss constant

(b) Acceleration factor

(c) Blocking factor

(d) Lagrange multiplier

29. In the load-frequency control system with free governor action, the increase in load demand under steady condition is met

(a) Only by increased generation due to opening of steam valve

(b) Only by decrease of load demand due to drop in system frequency

(c) Partly by increased generation and partly by decrease of load demand

(d) Partly by increased generation and partly by increased generator excitation

30. Fault calculations using computer program are usually done by

(a) Y_{bus} method

(b) Z_{bus} method

(c) Both of the above

(d) None of the above

31. The per unit value of a 4 Ω resistor at 100 MVA base and 10 kV base voltage is

(a) 2 pu

(b) 4 pu

(c) 0·4 pu

(d) 40 pu

32. An unloaded generator with a pre-fault voltage 1 pu has the following sequence impedances :

Z_0 = j 0·15 pu, $Z_1 = Z_2$ = j 0·25 pu

The neutral is grounded with a reactance of 0·05 pu. The fault current in pu for a single-line to ground fault is

(a) 3·75 pu

(b) 4·28 pu

(c) 6 pu

(d) 7·25 pu

33. For a fault in a power system, the term critical clearing time is related to

(a) Reactive power limit

(b) Transient stability limit

(c) Short circuit current limit

(d) Steady state stability limit

34. The rate of rise of re-striking voltage (RRRV) is dependent upon

(a) Resistance of the system only

(b) Inductance of the system only

(c) Capacitance of the system only

(d) Inductance and capacitance of system

35. The method used to implement an asynchronous link is

(a) DC back to back connected converter

(b) 0 – 360° static phase shifter

(c) Rotary transformer

(d) Static Var compensator

36. The concentration of minority carriers in an extrinsic semiconductor under equilibrium is

(a) Directly proportional to the doping concentration

(b) Inversely proportional to the doping concentration

(c) Directly proportional to the intrinsic concentration

(d) Inversely proportional to the intrinsic concentration

37. For a Silicon n-p-n transistor, the base to emitter voltage (V_{BE}) is 0·7 V and the collector to base voltage (V_{CB}) is 0·2 V. Then the transistor is operating in the

(a) Normal active mode

(b) Saturation mode

(c) Inverse active mode

(d) Cut-off mode

38. In an open circuited p-n junction diode space charge density at the junction is

(a) Maximum

(b) Zero

(c) Positive

(d) Negative

39. Early effect is the modulation of effective base width by

(a) Emitter voltage

(b) Emitter current

(c) Collector voltage

(d) Junction temperature

40. A Bipolar Junction Transistor (BJT) works in three regions :

1. Saturation
2. Active
3. Cut-off

If BJT is to be used in amplifier circuit, the region it works in is/are

(a) 1, 2 and 3

(b) 1 and 2 only

(c) 2 only

(d) 1 only

41. Match List I with List II and select the correct answer using the code given below the lists :

List I	*List II*
A. BJT	1. Population inversion
B. MOS capacitor	2. Pinch-off voltage
C. LASER diode	3. Early effect
D. JFET	4. Flat-band voltage

Code :

	A	B	C	D
(a)	3	1	4	2
(b)	2	1	4	3
(c)	3	4	1	2
(d)	2	4	1	3

42. Material used for fabrication of Tunnel diode is

(a) Ge or GaAs

(b) Si and GaAs

(c) Si and InSb

(d) Ge and InSb

43. Generally, the gain of a transistor falls at high frequencies due to the

(a) Internal capacitances of the device

(b) Coupling capacitor at the input

(c) Skin effect

(d) Coupling capacitor at the output

44. Three identical amplifiers, each having a gain of $\frac{A_o}{2} \angle 60°$ are connected in cascade. The positive feedback loop has a gain of 0·008. The value of A_o that will render the cascaded system oscillatory is

(a) 10

(b) – 10

(c) 250/3

(d) 250

45. Virtual ground property of operational amplifier indicates that

(a) Inverting and non-inverting terminals are connected to ground

(b) Inverting and non-inverting terminals are at the same potential

(c) System is at rest

(d) Any one terminal is connected to ground

46. A comparator circuit is used to

(a) Mark the instant when an arbitrary waveform attains some reference level

(b) Switch off a circuit when output becomes zero

(c) Switch on and off a circuit alternately at a particular rate

(d) Mark the instant when the input voltage becomes constant

47. In a typical IC monostable multivibrator circuit, at the falling edge of the trigger input, the output switches HIGH for a period of time determined by the

(a) Value of the RC timing components

(b) Amplitude of the input trigger

(c) Frequency of the input trigger

(d) Magnitude of the dc supply voltage

48. Pull-up register is needed for an open collector gate

(a) To provide V_{CC} for the IC

(b) To provide ground for the IC

(c) To provide the HIGH voltage

(d) To provide the LOW voltage

49. For a bi-directional synchronous counter

(a) Each flip-flop divides the frequency of its clock input by 2

(b) Each flip-flop output is used as the clock input to the next flip-flop

(c) No decoding logic is required

(d) Each flip-flop is clocked at the same time

50. Match List I with List II and select the correct answer using the code given below the lists :

List I	*List II*
A. Shift registers	1. Frequency division
B. Counter	2. Addressing in memory chips
C. Decoder	3. Serial to parallel data conversion

Code :

	A	B	C
(a)	2	1	3
(b)	3	1	2
(c)	2	3	1
(d)	3	2	1

51. A divide-by-6 counter is obtained using

(a) 6-bit rippie counter

(b) 6-bit ring counter

(c) 3-bit ripple counter

(d) 3-bit twisted-ring counter

52. To operate correctly, starting a ring counter requires

(a) Clearing all the flip-flops

(b) Presetting one flip-flop and clearing all others

(c) Clearing one flip-flop and presetting all others

(d) Presetting all the flip-flops

53. The present microinstruction fetched from a micro-programmed control unit is held in the

(a) Next address register

(b) Control address register

(c) Control data register

(d) Pipeline register

54. Following is a 16-bit register for 8085 microprocessor :

(a) Stack pointer

(b) Accumulator

(c) Register B

(d) Register C

55. The sub-system which ensures that only one I/O device is active at a time to avoid a bus conflict caused by two I/O devices writing different data to the same bus is

(a) Control bus

(b) Control instructions

(c) Address decoder

(d) Priority encoder

56. The address bus of Intel 8085 is 16-bit wide and hence the memory which can be accessed by this address bus is

(a) 2 k bytes

(b) 4 k bytes

(c) 16 k bytes

(d) 64 k bytes

57. The register which holds the information about the nature of results of arithmetic or logic operations is called as

(a) Accumulator

(b) Condition code register

(c) Flag register

(d) Process status register

58. The correct sequence of steps in the instruction cycle of a basic computer is

(a) Fetch, Execute, Decode and Read effective address

(b) Read effective address, Decode, Fetch and Execute

(c) Fetch, Decode, Read effective address and Execute

(d) Fetch, Read effective address, Decode and Execute

59. The instruction that exchanges top of stack with HL pair is

(a) XTHL

(b) SPHL

(c) PUSH H

(d) POP H

60. The following instruction copies a byte of data from the accumulator into the memory address given in the instruction :

(a) STA address

(b) LDAX B

(c) LHLD address

(d) LDA address

61. For a memory system, the cycle time is

(a) Same as the access time

(b) Larger than the access time

(c) Shorter than the access time

(d) Sub-multiple of the access time

62. When referring to instruction words, a mnemonic is

(a) A short abbreviation for the operand address

(b) A short abbreviation for the operation to be performed

(c) A short abbreviation for the data word stored at the operand address

(d) Shorthand for machine language

63. The instruction PCHL in 8085 is used for

(a) Load PC with contents of HL

(b) Load HL with contents of memory location pointed by PC

(c) Load HL with contents of PC

(d) Load PC with the contents of memory location pointed by HL pair

64. An 8085 microprocessor based system uses a 4K × 8-bit RAM whose starting address is AA00H. The address of the last byte in this RAM is

(a) 0FFFH

(b) 1000H

(c) B9FFH

(d) BA00H

65. The following is ***not*** true for RS232 standard :

(a) It establishes the way data is coded

(b) It defines signal voltage levels

(c) Does not decide data transmission rate

(d) It defines standard connector configurations

66. In case of dynamic memory

(a) Contents tend to decay over a period of time

(b) Contents are retained without distortion

(c) Power consumption is low

(d) The speed is low as compared to static memory

67. How many Initialization Command Words are essential if 8259 is used in single chip with special fully nested mode configuration ?

(a) 2

(b) 3

(c) 4

(d) 1

68. Number of address lines necessary to connect 8 k memory chip is

(a) 10

(b) 11

(c) 12

(d) 13

69. In double sideband suppressed carrier modulation, the modulated wave undergoes phase reversal, whenever

(a) Modulating signal's amplitude decreases

(b) Modulating signal's amplitude increases

(c) Modulating signal crosses zero

(d) Carrier signal crosses zero

70. One of the main functions of RF stage amplifier in Super Heterodyne Radio Receiver is to

(a) Provide improved tracking

(b) Permit better adjacent channel rejection

(c) Increase tuning range of the receiver

(d) Improve rejection of image frequency

71. Good voice reproduction via PCM requires 128 quantization levels. If bandwidth of voice channel is 4 kHz, then data rate is

(a) 250 kbps

(b) 128 kbps

(c) 56 kbps

(d) 28 kbps

72. All types of linear modulation can be detected by

(a) Product demodulator

(b) Envelop detector

(c) Filtering

(d) Linear detector

73. Bandwidth occupied by 100 MHz carrier, AM modulated by signal frequency of 10 kHz is

(a) 100 MHz

(b) 20 kHz

(c) 10 kHz

(d) 110 MHz

74. The maximum deviation allowed in a frequency modulation system is 100 kHz; the modulating signal frequency is 10 kHz. The bandwidth requirement as per Carson's rule will be

(a) 220 kHz

(b) 110 kHz

(c) 120 kHz

(d) 210 kHz

75. A binary data is to be sent at the rate of 100 kbps over a channel with 60 dB transmission loss and noise power spectral density $N_O = 10^{-12}$ W/Hz at the receiver. The digital modulation system that will require minimal transmitted power if probability of error is to be maintained at 10^{-3} is

(a) Non-coherent ASK

(b) Coherent BFSK

(c) BPSK

(d) 16-array PSK

76. The type of noise reduced by limiters in FM receivers is

(a) Avalanche noise

(b) Burst noise

(c) Narrow band-pass noise

(d) Impulse noise

77. A binary channel with capacity 36 kbps is available for PCM transmission. If signal is band limited to 3·2 kHz, then approximate values of quantizing levels (L) and sampling frequency (f_s) respectively are

(a) 32 and 3·6 kHz

(b) 64 and 7·2 kHz

(c) 64 and 3·6 kHz

(d) 32 and 7·2 kHz

78. The following events will ***not*** happen when quantizing noise is decreased in PCM :

(a) Increase in the number of standard levels

(b) Increase in bandwidth

(c) Decrease in channel noise

(d) Decrease in randomness due to difference in digit sent and actual signal at an instant

79. In a super-heterodyne receiver, the frequency of local oscillator is

(a) Half that of incoming signal

(b) Slightly less than that of incoming signal

(c) Higher than that of incoming signal

(d) Equal to that of incoming signal

80. Digital modulating system among the following is

(a) PPM

(b) PCM

(c) PWM

(d) PFM

81. DPCM is particularly suited for

(a) Radar signals transmission

(b) Radio signals transmission

(c) Speech signals transmission

(d) Seismic signals transmission

82. A 6-pole, 50 Hz, 3-phase induction motor with a rotor resistance of 0·25 Ω develops a maximum torque of 10 Nm at 875 rpm. The rotor reactance and slip at maximum torque is

(a) 2 Ω and 0·125 pu

(b) 2 Ω and 0·25 pu

(c) 1 Ω and 0·25 pu

(d) 1 Ω and 0·125 pu

83. Frequency frogging is used in carrier system to

(a) Conserve frequencies

(b) Reduce distortion

(c) Reduce cross talk

(d) Reduce bandwidth

84. A comparison of FDM and TDM systems shows that

(a) FDM requires lower bandwidth, but TDM has greater noise immunity

(b) FDM has greater noise immunity and requires lower bandwidth than TDM

(c) FDM requires channel synchronization, while TDM has greater noise immunity

(d) FDM requires more multiplexing, while TDM requires band-pass filter

85. In time division multiplexing, cross talk may be avoided by

(a) Proper base band filtering

(b) Proper selection of time of sampling

(c) Increasing the amplitude of signal

(d) Proper quantization

86. Match List I *(Device)* with List II *(Switching Time)* and select the correct answer using the code given below the lists :

List I (Device)	*List II (Switching Time)*
A. TRIAC	1. 5 – 10 μs
B. SCR	2. 100 – 400 μs
C. MOSFET	3. 50 – 100 μs
D. IGBT	4. 200 – 400 μs

Code :

	A	B	C	D
(a)	4	3	2	1
(b)	1	2	3	4
(c)	4	2	3	1
(d)	1	3	2	4

87. The following is a unipolar device :

(a) BJT

(b) IGBT

(c) GTO

(d) MOSFET

88. If n is the number of electrons per unit volume of the semiconductor and v_d is the drift velocity of the electrons, then the current flowing through a semiconductor is given by

(a) $i = \frac{n}{v_d}$

(b) $i = n v_d$

(c) $i = \frac{v_d}{n}$

(d) $i = n v_d^{1/2}$

89. A thyristor has a PIV of 650 V. The voltage safety factor is 2. Then the voltage upto which the device can be operated is given by

(a) 1300 V

(b) 650 V

(c) 325 V

(d) 230 V

90. When a thyristor is in the forward blocking state, then

(a) All 3 junctions are reverse biased

(b) Anode and cathode junctions are forward biased but gate junction is reverse biased

(c) Anode junction is forward biased but other two are reverse biased

(d) Anode and gate junctions are forward biased but cathode is reverse biased

91. An SCR triggered by a current pulse applied to the gate-cathode can be turned off

(a) By applying a pulse to the cathode

(b) By applying a pulse to the anode

(c) By applying another pulse of opposite polarity to the gate-cathode

(d) By reversing the polarity of the anode and cathode voltage

92. In forward-bias portion of the thyristor's i-v characteristic, the number of stable operating regions is

(a) One

(b) Two

(c) Three

(d) None

93. A dc source of 100 volts supplies a purely inductive load of 0·1 H; the controller is an SCR in series with source and load. If the specified latching current is 100 mA, then the minimum width of the gating pulse to ensure turn-on of SCR would be

(a) 10 μs

(b) 50 μs

(c) 100 μs

(d) 1 μs

94. In a three-phase semi-converter, if firing angle is less than or equal to 60°, then the duration of conduction of each thyristor and diode would be respectively

(a) 60° and 60°

(b) 90° and 30°

(c) 120° and 120°

(d) 180° and 180°

95. A three-phase semi-converter feeds the armature of a separately excited dc motor supplying a non-zero load torque. For steady state operation the motor current is found to assume zero value at certain instances of time. At such instances the armature voltage

(a) Is equal to the instantaneous value of ac voltage

(b) Is equal to the instantaneous value of motor back emf

(c) Assumes an arbitrary value

(d) Becomes zero

96. A single-phase two pulse converter feeds an R-L load with insufficient smoothing but the conduction is continuous. If the resistance of the load circuit is increased, then

(a) The ripple content of the load current will remain the same

(b) The ripple content of the load current will decrease

(c) The ripple content of the load current will increase

(d) There is possibility of discontinuous conduction due to an increase in the ripple content

97. A single-phase ac regulator fed from 50 Hz supply feeds a load having 4 Ω resistance and 12·73 mH inductance. The control range of firing angle will be

(a) 0° to 180°

(b) 45° to 180°

(c) 90° to 180°

(d) 0° to 45°

98. A voltage source inverter (VSI) is normally employed when

(a) Source inductance is large and load inductance is small

(b) Source inductance is small and load inductance is large

(c) Both source inductance and load inductance are small

(d) Both source inductance and load inductance are large

99. A current source inverter is obtained by inserting a large

(a) Inductance in series with dc supply

(b) Capacitance in parallel with dc supply

(c) Inductance in parallel with dc supply

(d) Capacitance in series with dc supply

100. Among the following pairs, the one ***not*** correctly matched is

(a) UJT — Intrinsic stand-off ratio

(b) FET — Pinch-off voltage

(c) TRIAC — Breakdown voltage

(d) DIAC — Firing voltage

101. The rated slip of an induction motor at full-load is 5% while the ratio of starting current to full load current is four. The ratio of the starting torque to full load torque would be

(a) 0·6

(b) 0·8

(c) 1·0

(d) 1·1

Directions : *Each of the next nineteen (19) items consists of two statements, one labelled as the 'Statement (I)' and the other as 'Statement (II)'. You are to examine these two statements carefully and select the answers to these items using the codes given below :*

Codes :

(a) Both Statement (I) and Statement (II) are individually true and Statement (II) is the correct explanation of Statement (I)

(b) Both Statement (I) and Statement (II) are individually true but Statement (II) is ***not*** the correct explanation of Statement (I)

(c) Statement (I) is true but Statement (II) is false

(d) Statement (I) is false but Statement (II) is true

102. *Statement (I) :* ECL gate has the highest speed of operation.

Statement (II) : The transistors in ECL gate operate in active region.

103. *Statement (I) :* In a transistor switching circuit, it is desirable that the transistor should not be driven into hard saturation for fast switching applications.

Statement (II) : When a transistor is under saturation state, both its emitter-base and collector-base junctions remain under forward bias.

104. *Statement (I) :* Most JFETs are designed to work in depletion mode.

Statement (II) : Depletion mode takes advantage of very high input resistance of reverse biased state.

105. *Statement (I) :* A good amplifier should not only amplify but also should faithfully reproduce the input signal.

Statement (II) : Distortion takes place in amplifiers due to non-linearity of the devices.

106. *Statement (I) :* While deriving the equation of torque developed in non-salient pole machines, only the fundamental components of the stator and the rotor mmfs are considered, and are represented by space phasors F_S and F_R respectively, directed along their respective magnetic axes, separated by an angle δ.

Statement (II) : The two mmfs F_S and F_R cause the appearance of stator and rotor poles, along with their respective magnetic axis which results in the development of electromagnetic torque.

107. *Statement (I) :* In tuned amplifier, a high gain is achieved at a narrow band of frequencies.

Statement (II) : A high-Q parallel resonant circuit is used as load in the amplifier.

108. *Statement (I) :* In a negative feedback amplifier, the noise voltage due to noise generated within the amplifier is reduced.

Statement (II) : Negative feedback reduces the amplifier gain.

109. *Statement (I) :* A feedback amplifier can oscillate under certain conditions.

Statement (II) : Loop gain is infinity and phase shift is zero during oscillation.

110. *Statement (I) :* A push-pull amplifier gives more output per active device for a given amount of distortion.

Statement (II) : Even harmonics are absent in the output of a push-pull amplifier.

111. *Statement (I) :* Much of the distortion introduced in large signal amplifiers is eliminated by push-pull circuit.

Statement (II) : The signals applied to the two transistors in push-pull mode are 180° out of phase.

112. *Statement (I) :* An RC phase shift oscillator satisfies Barkhausen criteria of oscillations.

Statement (II) : An RC phase shift oscillator must use 3 equal valued resistors and 3 equal valued capacitors.

113. *Statement (I) :* Tristate logic is used for bus oriented systems.

Statement (II) : The tristate logic has three output states : 0, 1 and indeterminant.

114. *Statement (I) :* XOR gate is not a universal gate.

Statement (II) : It is not possible to realize any Boolean function using XOR gates only.

115. *Statement (I) :* Star/Delta connection is commonly used for high voltage to low voltage transformation.

Statement (II) : It is desirable to ground the neutral on the high voltage side.

116. *Statement (I) :* 2's complement arithmetic is preferred in digital computers.

Statement (II) : The hardware required to obtain the 2's complement of a number, is simple.

117. *Statement (I) :* In 8255, port A can work as input port only.

Statement (II) : Port A can work in mode 0, mode 1 or mode 2.

118. *Statement (I) :* The main function of a starter in a 3-phase induction motor is to provide starting torque.

Statement (II) : The 3-phase induction motor is a self-starting motor.

119. *Statement (I) :* The performance of a phase controlled converter is degraded for large values of firing angle α.

Statement (II) : The output voltage is reduced for large values of α.

120. *Statement (I) :* Multiple pulse width modulation is used to reduce the harmonic content in inverters.

Statement (II) : The higher order harmonics can be easily filtered using passive filters.

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