ELECTRICAL ENGINEERING

PAPER-II

1. Match List-I with List-II and select the correct answer using the code given below the list:

List –I

(Logic Circuit/function)

A. D flip-flop

B. T flip-flop

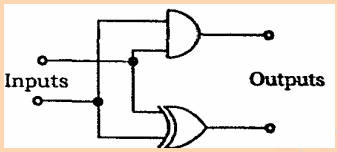
C. Exclusive

D. Half –adder

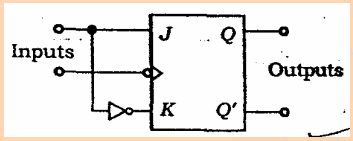
List II

(Circuit realization)

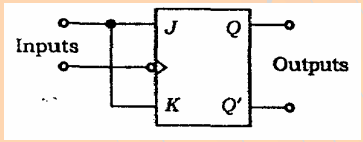
1.



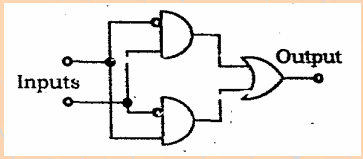
2.



3.



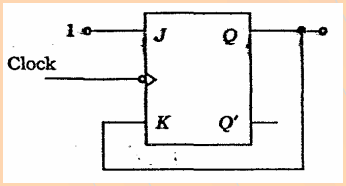
4.



Code:

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

2.



In the circuit given in the above figure, Q =0 initially. What shall be the subsequent states of Q when clock pulses are given?

a. 1, 0,1,0, …

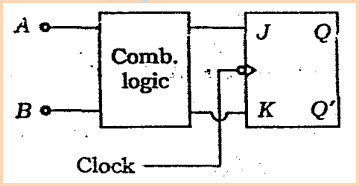
b. 0, 0, 0, 0…

c. 1, 1, 1, 1, …

d. 0, 1, 0, 1, …

3. The following truth table has to be realized with the circuit shown in the figure:

A	B	Q_{n+1}
0	0	Q'_n
0	1	1
1	0	Q_n
1	1	0



What is the output of the combinational logic circuit to the J input?

a. $\overline{AB}$

b. $\overline{A}$

c. $\overline{B}$

d. AB

4. A J-K flip-flop can be made form an S-R flip-flop by using two additional

a. NAND gates

b. OR gates

c. NOT gates

d. NOR gates

5. Three devices P, Q and R have to be connected to an 8085 microprocessor. Device P has the highest priority and device R has the lowest priority. In this

context, which of the following is the correct assignment of interrupt inputs?

a. P uses TRAP, Q uses RST 5.5 and R uses RST 6.5
b. P uses RST 5.5, Q uses RST 6.5 and R uses RST 7.5
c. P uses RST 7.5, Q uses RST 6.5 and R uses RST 55
d. P uses RST 5.5, Q uses RST 6.5 and R uses TRAP

6. The content of the program counter of an Intel 8085A microprocessor specifies which one of the following?

a. The address of the instruction being executed
b. The address of the instruction executed earlier
c. The address of the next instruction to be executed
d. The number of instructions executed so far

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

List-I

(Semiconductor technology)

A. TTL
B. ECL
C. NMOS
D. CMOS

List II

(Characteristic)

1. Maximum power consumption
2. Highest packing density
3. Least power consumption
4. Saturated logic

Code:

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

8. Both the ALU and control section of CPU employ which special purpose storage locations?

a. Buffers
b. Decoders
c. Accumulators
d. Registers

9. In an Intel 8085 A, what is the content of the instruction register (IR)?

a. Op-code for the instruction being executed
b. Operand for the instruction being executed
c. Op-code for the instruction to be executed next
d. Operand for the instruction to be executed next

10. In an Intel 8085A microprocessor, why is ready signal used?

a. To indicate to user that the microprocessor is working and is ready for use
b. To provide proper WAIT states when the microprocessor is communicating with a slow peripheral device
c. To slow down a fast peripheral device so as to communicate at the microprocessor's speed
d. None of the above

11. In an Intel 8085A, which is always the first machine cycle of an instruction?

a. An op-code fetch cycle
b. A memory read cycle
c. A memory write cycle
d. An I/O read cycle

12. The addressing mode used in the instruction JMP F 347H in case of an Intel 8085A microprocessor is which one of the following?

a. Direct
b. Register-indirect
c. Implicit
d. Immediate

13. What is the number of machine cycles in the instruction LDA 2000 H that consists of thirteen states?

a. 2
b. 3
c. 4
d. 5

14. Match list-I with list-II and select the correct answer using the code given below the lists:

List-I

(Feature of Instruction)

A. Maskable interrupt
B. Signal
C. Instruction
D. Memory location 002C H

List-II
(Instruction)
1. RST 5.5
2. XTHIL
3. SID
4. RST 6.5

Code:

	A	B	C	D
b.	4	1	2	3
c.	2	3	4	1
d.	4	3	2	1
e.	2	1	4	3

15. An Intel 8085A microprocessor is operated at a frequency of 2 MHz. If the instruction LXI H, E000 H that takes ten T states, is executed, then what is the instruction cycle time?
   a. 10 μs
   b. 5 μs
   c. 4 μs
   d. 2.5 μs

16. For a single-phase a.c. to d.c. controlled rectifier to operate in regenerative m ode, which of the following conditions should be satisfied?
   a. Half –controlled bridge, $\alpha < 90°$, source of e.m.f. in load
   b. Half-controlled bridge, $\alpha > 90°$, source of e.m.f. in load
   c. Full-controlled bridge, $\alpha > 90°$, source of e.m.f. in load
   d. Full-controlled bridge, $\alpha < 90°$, source of e.m.f. in load

17. A half-controlled bridge converter is operating from an r.m.s. input voltage of 120V. neglecting the voltage drops, what are the mean load voltage at a firing delay angle of 0°and 180°, respectively?
   a. $\frac{120\times 2\sqrt{2}}{\pi}$ V and 0
   b. 0 and $\frac{120\times 2\sqrt{2}}{\pi}$ V
   c. $\frac{120\sqrt{2}}{\pi}$ V and 0
   d. 0 and $\frac{120\sqrt{2}}{\pi}$ V

18. For a step-down d.c. chopper operating with discontinuous load current, what is the expression for the load voltage? (K is duty ratio of chopper)
   a. $V_0 = V_{d.c} \times K$
   b. $V_0 = V_{d.c} / K$
   c. $V_0 = V_{d.c} / (1-K)$
   d. $V_0 = V_{d.c} (1-K)$

19. An ideal chopper is operating at a frequency of 500 Hz form a 60 V battery input. It is supplying a load having 3 Ω resistance and 9 mH inductance. Assuming the load is shunted by a perfect commutating diode and assuming battery is lossless, what is the mean load current at an on/off ratio of 1/1?
   a. 10 A
   b. 15 A
   c. 20 A
   d. None of the above

20. The maximum junction-temperature of a transistor is 150 °C and the ambient temperature is 25 °C. If the total thermal impedance is 1 °C/W, what is the maximum power dissipation?
   a. 1/175 W
   b. 175 W
   c. 125 W g
   d. 1/125 W

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

List-I
(Device)
A. Triac
B. Reverse conducting thyristor
C. Diac

List-II
(Monolithic construction of)
1. Two thyristors in anti-parallel
2. A thyristor and a diode in anti-parallel
3. Two diodes in anti-parallel

Code:

A	B	C

a.	1	2	3
b.	3	2	1
c.	2	3	1
d.	3	1	2

22. Consider the following statements about analog communication and multiplexing:
    1. Noise problem for analog communication has the greatest effect on TDM system.
    2. Noise problem for analog communication has the least effect on SDM system.

    Which of the statements given above is/are correct?
    a. 1 only
    b. 2 only
    c. Both 1 and 2
    d. Neither 1 nor 2

23. Consider the following statements:
    1. An active satellite is one carrying a receiver, a transmitter and power supplies.
    2. A passive satellite is simply a metalized sphere reflecting radio signals back to the earth.

    Which of the statements given above is/are correct?
    a. 1 only
    b. 2 only
    c. Both 1 and 2
    d. Neither 1 nor 2

24. If the ASCII character H is sent and the character I is received, what type of error is represented?
    a. Single bit
    b. Multiple-bit
    c. Burst
    d. Recoverable

25. In coding theory, if

    $\bar{L}$ = average word length of the code word

    $\bar{L}_{min}$ = minimum average word length of the code word

    Then what is the efficiency of source-code (n)?

    a. $\sqrt{\frac{\bar{L}_{min}}{L}}$

    b. $\sqrt{\frac{\bar{L}}{\bar{L}_{min}}}$

    c. $\sqrt{\frac{\bar{L}_{min}}{\bar{L}}}$

    d. $\frac{\bar{L}}{\bar{L}_{min}}$

26. With the increase in the transmission bandwidth, received signal-power in AM and FM will, respectively
    a. Increase, increase
    b. Remain same , increase
    c. Increase, remain same
    d. Remain same, remain same

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

    List-I

    (Modulation)

    A. PSK
    B. FM
    C. AM

    List-II

    (Detector/Filter)

    1. Square-law detector
    2. Ratio detector
    3. Matched filter

    Code:

	A	B	C
a.	3	1	2
b.	3	2	1
c.	2	1	3
d.	2	3	1

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

    List-I

    (Characteristic)

    A. Capture effect is a characteristic of
    B. Granular noise occurs in
    C. Guard band is required in

    List-II

    (Modulation)

    1. FDM
    2. PCM
    3. FM

    Code:

	A	B	C
a.	3	2	1
b.	3	1	2
c.	1	2	3
d.	1	3	2

29. Which signaling scheme is most affected by noise?
    a. ASK
    b. FSK
    c. PSK
    d. QAM

30. What are the three steps in generating PCM in the correct sequence?
    a. Sampling, quantizing and encoding
    b. Encoding sampling and quantizing
    c. Sampling encoding and quantizing
    d. Quantizing, sampling and encoding

31. In an AM system, for satisfactory operation, carrier frequency must be n times the bandwidth of message-signal. What is the value of n?
    a. > 2
    b. > 5
    c. > 10
    d. > 50

32. For an AM signal, the bandwidth is 10 kHz and the highest frequency component present is 750 kHz. What is the carrier frequency used for this AM signal?
    a. 675 kHz
    b. 700 kHz
    c. 705 kHz
    d. 710 kHz

33. What is the main object of trellis coding?
    a. To narrow the bandwidth
    b. To simplify modulation
    c. To increase the data rate
    d. To reduce the error rate

34. When zero mean Gaussian noise of variance N is applied to an ideal half-wave rectifier, what is the mean square value of the rectified noise?
    a. N/4
    b. N/2
    c. N
    d. 2N

35. When TRAP interrupt is triggered in an Intel 8085A, the program control is transferred to which one of the following?
    a. 0020 H
    b. 0024 H
    c. 00 28 H
    d. 00 2C H

36. The stack pointer of an 8085A microprocessor contains ABCD H.

    PUSH PSW
    XTHL
    PUSH D
    JMP EC 75 H

    At the end of the execution of the above instructions, what would be the content of the stack pointer?
    a. ABCB H
    b. ABCA H
    c. ABC9 H
    d. ABC8 H

37. If the HLT instruction of an Intel 8085A microprocessor is executed
    a. The microprocessor is disconnected form the system bys till the RESET us pressed
    b. The microprocessor halts the execution of the program and returns to the monitor
    c. The microprocessor enters into a HALT state and the buses are tri-stated
    d. The microprocessor reloads the program counter form the locations 0024 H and 0025 H

38. Consider the following statements:

    Skewing of rotor slots in a 3 phase induction motor (cage rotor) may

    1. Introduce additional leakage reactance
    2. Eliminate slot harmonics

    Which of the statements given above is/are correct?
    a. 1 only
    b. 2 only
    c. Both 1 and 3
    d. Neither 1 nor 2

39. In the equivalent circuit of a double cage induction motor, the two rotor cages can be considered
    a. To be in parallel
    b. To be in series-parallel

c. To be in series
d. To be in parallel with stator

40. A 3 phase squirrel-cage induction motor is started by means of a star/delta switch. What is the starting current of the motor?
a. 3 times the current with direct on line starting
b. $\frac{1}{3}$ times the current with direct on line starting
c. $\frac{1}{\sqrt{3}}$ times the current with direct on line starting
d. $\sqrt{3}$ times the current with direct on line starting

41. Sludge formation in transformer oil is due to which one of the following?
a. Ingress of dust particles and moisture in the oil.
b. Appearance of small fragments of paper, varnish, cotton and other organic materials in the oil
c. Chemical reaction of transformer oil with the insulating materials
d. Oxidation of transformer oil

42. A single-phase transformer rated for 220/440 V, 50 Hz. This frequency operation at rated voltage results in which one of the following?
a. Increases of both eddy-current and hysteresis losses
b. Reduction of both eddy-current and hysteresis losses
c. Reduction of hysteresis loss and increase in eddy-current loss
d. Increase of hysteresis loss and no change in the eddy-current loss

43. What is the load at which maximum efficiency occurs in case of a 100 kVA transformer with iron loss of 1 kW and full–load copper loss of 2 kW?
a. 100 kVA
b. 70.7 kVA
c. 50.5 kVA
d. 25.2 kVA

44. Match list-I with list-II and select the correct answer using the code given below the lists:

List-I

(Method of speed control of 3 phase wound-type induction motor)

A. Stator voltage control
B. Rotor resistance control
C. Constant volts/Hz control
D. Injection of voltage in rotor circuit

List-II

(Performance achieved)

1. Both speed and p.f. can be controlled
2. Maximum torque remains constant
3. Starting torque decreases
4. Starting torque decreases

Code:

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

45. Cores of large power transformers are made form which one of the following?
a. Hot-rolled steel
b. Cold-rolled non-grain oriented steel
c. Cold-rolled grain oriented steel
d. Ferrite

46. A transformer has a percentage resistance of 2% and percentage reactance of 4%. What are its regulations at power factor 0.8 leading, respectively?
a. 4% and - 0.8%
b. 3.2% and – 1.6%
c. 1.6% and – 3.2 %
d. 4.8% and – 0.6%

47. The daily energy produced in a thermal power station is 720 MWh at a load factor of 0.6. What is the maximum demand of the station?
a. 50 MW
b. 30 MW
c. 72 MW
d. 720 MW

48. Taking the density of water to be 1000 kg/m^2, how much power would be developed by a hydroelectric generator unit, assuming 100% efficiency, with 1.0 m head and 1.0 m^3/s discharge?
a. 2.90 kW
b. 4.45 kW
c. 9.80 kW

d. 19.60 kW

49. Consider the following statements regarding the nuclear power plans:
1. A thermal rector needs a moderator material
2. In a nuclear reactor, multiplication factor is kept almost equal to one.
3. Nuclear power plants are used as peak load plants only.

Which of the statement given above are correct?
a. 1, 2 and 3
b. 1 and 2 only
c. 2 and 3 only
d. 1 and 3 only

50. The full-load copper loss and iron loss of a transformer are 6400 W and 5000 W, respectively. What are the above copper loss and iron loss, respectively at half-load?
a. 3200 W, 2500W
b. 3200 W, 5000W
c. 1600 W, 1250 W
d. 1600 W, 5000 W

51. In a 3 phase, 5 kV, 5 MVA systems, what is the base impedance?
a. 5 ohms
b. 50 ohms
c. 500 ohms
d. 0.5ohm

52. Match list-I with list-II and select the correct answer using the code given below the lists:

List-I
A. Transient stability improvement
B. Economic dispatch
C. Load frequency control
D. Dynamic stability

List-II
1. Incremental transmission loss
2. Area control error
3. Power system stabilizers
4. Turbine fast valuing

Code:

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

53. Consider the following statements:
1. Equivalent- T circuit of a long line is preferred to equivalent - π circuit.
2. The nature of reactive power compensation is different for peak load and off-peak load conditions.
3. Ferranti effect is significant only on medium and long lines.

Which of the statements given above are correct?
a. 1 and 2 only
b. 1 and 3 only
c. 2 and 3 only
d. 1, 2 and 3

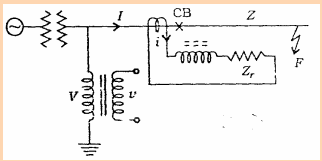
54. For an extra-high voltage overhead transmission line, four conductors are used per phase (in a bundle) at the corners of a square of sides meter. The GMR (geometric mean radius) of each conductor is r_m meter.

What is the GMR of the bundle conductor?
a. $(r^1_m \times s^2 \times \sqrt{2s})^{1/4}$
b. $\left(r_m^{'} \times s^3\right)^{1/4}$
c. $\left(r_m^{'} \times 3s^3\right)^{1/4}$
d. $\left[r_m^{'} \times \left(\sqrt{2s}\right)^3\right]^{1/4}$

55. When is the Ferranti effect on long overhead lines experienced?
a. The line is lightly loaded
b. The line is heavily loaded
c. The line is fully loaded
d. The power factor is unity

56. What is the surge impedance loading of a lossless 400 kV, 3-phase, 50Hz overhead line of average of surge impedance of 400 ohms?
a. 400 MW
b. $400\sqrt{3}$ MW
c. $400/\sqrt{3}$ MW
d. 400 kW

57.



The figure given above shows a schematic arrangement of a Distance Relay provided with a 'Replica Impedance' Z_r. The CT ratio = *I/v* and VT ratio = *V/v*. When a fault occurs on the line being protected, when would the relay operate?

a. $Z_r > Z$
b. $Z_r < Z$
c. $Z_r > Z$. *I/i*
d. $Z_r > Z$. *V/v*

58. A 50 Hz, 3-phase synchronous generator has inductance per phase of 15 mH. The capacitance of generator and circuit breaker is 0.002 μF.What is its natural frequency of oscillation?

a. 29 kHz
b. 2.9 kHz
c. 290 kHz
d. 29 MHz

59. Consider the following statements regarding HVDC power transmission:

1. The modern HVDC systems use 12-pulse converters.
2. DC systems never use ground or sea return.
3. Most of present-day d.c. schemes are two-terminal links.

Which of the statements given above is/are correct?

a. 1, 2 and 3
b. 1 only
c. 2 and 3 only
d. 1 and 3 only

60. Two generating stations connected to a load centre having capacity of 50 MVA and 75 MVA deliver 100 MW to the load. The incremental cost of plant 1 is 15 + $0.15P_1$ and that of the plant 2 is 18 + $0.15P_2$. What are the value of P_1 and P_2, respectively?

a. 60 MW and 40 MW
b. 50 MW each
c. 72 MW and 28 MW
d. 30 MW and 70 MW

61. A two-quadrant d.c. to d.c. chopper can operate with which of the following load conditions?

1. +ve voltage, +ve current
2. –ve voltage, +ve current
3. –ve voltage, -ve current
4. +ve voltage, -ve current

Select the correct answer using the code given below:

a. 1 only
b. 1 and 2 only
c. 1 and 4 only
d. 3 and 4 only

62.

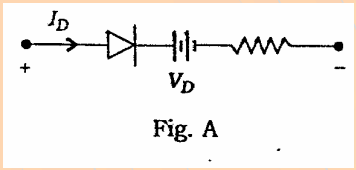


Fig. A

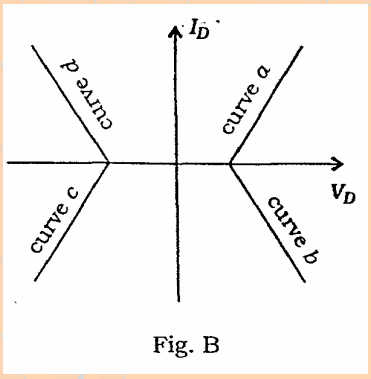


Fig. B

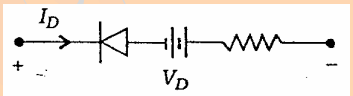


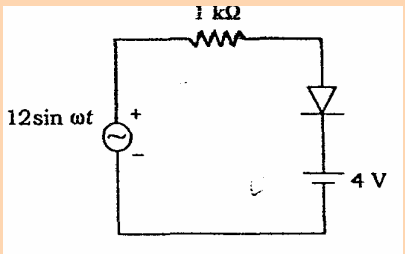
Fig. C

For the circuit shown in Fig. A, the V-I (voltage-current) characteristic of the circuit using ideal components is given by curve *a* in Fig. B.

Which curve in Fig. B represents the V-I characteristic for the circuit shown in Fig C?

a. Curve *a*
b. Curve b
c. Curve c
d. Curve d

63.



What is the peak current through the resistor in the circuit given above assuming the diode to be ideal?

a. 4 mA
b. 8 mA
c. 12 mA
d. 16 mA

64. For a rectifier circuit, percentage voltage regulation is equal to which one of the following?

a. $\frac{V_{no\ load} - V_{full\ load}}{V_{no\ load}} \times 100$

b. $\frac{V_{no\ load} - V_{full\ load}}{V_{full\ load}} \times 100$

c. $\frac{V_{no\ load} - V_{full\ load}}{V_{no\ load} + V_{full\ load}} \times 100$

d. $\frac{V_{full\ load}}{V_{no\ load}} \times 100$

65. A single-phase current source inverter is connected with capacitive load only. The waveform of the output voltage across the capacitor for constant source current will be

a. Sine wave
b. Square wave
c. Triangular wave
d. Step function

66. A modern power semiconductor device that combines the characteristics of BJT and MOSFET is

a. GTO
b. FCT
c. IGBT
d. MCT

67. A digital communication system uses 8-PSK modulation and transmits 3600 bps. What is the symbol rate?

a. 10800 symbols/sec
b. 450 symbols/sec
c. 28800 symbols/sec
d. 1200 symbols/sec

68. If two resistors of values R_1 and R_2 (at temperatures T_1 and T_2) are connected in series to form a white noise source, the equivalent noise temperature is

a. $\frac{R_1T_1 + R_2T_2}{R_1 + R_2}$

b. $\frac{R_1T_1 - R_2T_2}{R_1 + R_2}$

c. $T_1 + T_2$

d. $T_1.\frac{R_1}{R_2} + T_2.\frac{R_2}{R_1}$

69. The contents of Program Counter (PC), when the microprocessor is reading from 2FFF H memory location, will be

a. 2FFE H
b. 2FFF H
c. 3000 H
d. 3001 H

70. Carry flag is not affected after the execution of

a. ADD B
b. SBB B
c. INR B
d. ORA B

71. Which one is the indirect addressing mode in the following instructions?

a. LXIH 2050 H
b. MOV A, B
c. LDAX B
d. LDA 2050 H

72. An 8254 programmable interval timer consists of independent 16-bit programmable counters. This number is

a. 2
b. 3
c. 4
d. 5

73. What are the advantages of switching power supplies over linear power supplies?

1. The devices operate in linear/active region.
2. The devices operate as switches.
3. Power losses are less.

Select the correct answer using the code given below:

a. 1 and 3 only
b. 2 and 3 only
c. 1 and 2 only
d. 1, 2 and 3

74. Assertion (A): A d.c. motor draws high current at the time of starting.

Reason (R): While starting a d.c. motor, it takes some time to develop a non-zero value of back e.m.f.

a. Both A and R are individually true and R is the correct explanation of A

b. Both A and R are individually true but R is not the correct explanation of A
c. A is true but R is false
d. A is false but R is true

75. Assertion (A): For a 3-phase alternator operating on leading p.f at full load, the terminal voltage may be more than the no-load induced e.m.f

Reason (R): At leading power factor, the effect of armature reaction is demagnetizing.

a. Both A and R are individually true and R is the correct explanation of A
b. Both A and R are individually true but R is not the correct explanation of A
c. A is true but R is false
d. A is false but R is true

76. Assertion (A): AC armature windings are short chorded by selecting value of coil span more than the pole pitch.

Reason (R): Short chording is done to eliminate harmonics in the induced e.m.f.

a. Both A and R are individually true and R is the correct explanation of A
b. Both A and R are individually true but R is not the correct explanation of A
c. A is true but R is false
d. A is false but R is true

77. Assertion (A): The leakage reactance of a 3-phase induction motor should be small.

Reason (R): A small value of leakage reactance will increase the maximum power output of motor.

a. Both A and R are individually true and R is the correct explanation of A
b. Both A and R are individually true but R is not the correct explanation of A
c. A is true but R is false
d. A is false but R is true

78. Assertion (A): Both the efficiency and regulation of a 3-winding ideal transformer are 100%.

Reason (R): The flux leakage and the magnetic reluctance of the magnetic core in an ideal transformer are zero. Moreover, losses are absent in ideal transformers.

a. Both A and R are individually true and R is the correct explanation of A
b. Both A and R are individually true but R is not the correct explanation of A
c. A is true but R is false
d. A is false but R is true

79. Assertion (A): The 'short-circuit capacity' of a bus in a large power grid is defined as the product of the pre-fault voltage and the 3-phase fault current at a point very close to the bus.

Reason (R): The larger the short-circuit capacity, the large would be the equivalent source impedance at the bus.

a. Both A and R are individually true and R is the correct explanation of A
b. Both A and R are individually true but R is not the correct explanation of A
c. A is true but R is false
d. A is false but R is true

80. Assertion (A): It is not possible to design a current source using operational amplifier.

Reason (R): Operational amplifier is a voltage controlled voltage source.

a. Both A and R are individually true and R is the correct explanation of A
b. Both A and R are individually true but R is not the correct explanation of A
c. A is true but R is false
d. A is false but R is true

81. Assertion (A): Each memory cell of a DRAM requires refreshing every 2, 4 or 8 ms or its data will be lost.

Reason (R): DRAM stores 1s and 0s as charges on a small MOS capacitor which has tendency to leak off charges after a period of time.

a. Both A and R are individually true and R is the correct explanation of A
b. Both A and R are individually true but R is not the correct explanation of A
c. A is true but R is false
d. A is false but R is true

82. Assertion (A): Bandwidth of angle-modulated signal is infinite.

Reason (R): Angle modulation of a carrier result in the generation of an infinite number of an infinite number of sidebands.

a. Both A and R are individually true and R is the correct explanation of A
b. Both A and R are individually true but R is not the correct explanation of A
c. A is true but R is false
d. A is false but R is true

83. Assertion (A): In television transmission, interlaced scanning is used.

Reason (R): Interlaced scanning provides increased picture brightness.

a. Both A and R are individually true and R is the correct explanation of A
b. Both A and R are individually true but R is not the correct explanation of A
c. A is true but R is false
d. A is false but R is true

84. Consider the following statements in Johnson counter:

1. A MOD–6 Johnson counter requires 3 FFs.
2. Johnson counter requires decoding gates.
3. To decode each count, one logic gate is used. Each gate requires only two inputs regardless of the number of FFs.

Which of the statements given above are correct?

a. 1 and 2 only
b. 2 and 3 only
c. 1 and 3 only
d. 1, 2 and 3

85. What is the simplified form of the Boolean expression $T = (X + Y)(X + \bar{Y})(\bar{X} + Y)$?

a. $\bar{X}\bar{Y}$
b. $\bar{X}Y$
c. XY
d. $X\bar{Y}$

86. Match List–I with List-II and select the correct answer using the code given below the Lists:

List-I (Expression – I)

A. $ABC + AB\bar{C} + A\bar{B}C$
B. $\bar{A}B\bar{C} + AB\bar{C} + B\bar{C}$
C. $\bar{A}BC + A\bar{B}C + AB\bar{C} + ABC$
D. $\bar{A}\bar{B} + \bar{A}B + ABC$

List-II (Expression – II)

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

Codes:

a. A2, B1, C4, D3
b. A4, B3, C2, D1
c. A2, B3, C4, D1
d. A4, B1, C2, D3

87. The AND function can be realized by using only n number of NOR gates. What in n equal to?

a. 2
b. 3
c. 4
d. 5

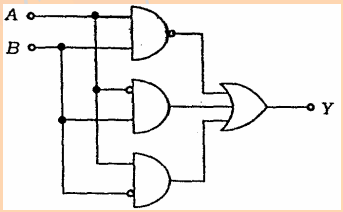
88. The Boolean expression $A.B + \bar{A}.\bar{B}$ is logically equivalent to which of the following?

1. $(A + \bar{B}).(\bar{A} + B)$
2. $(\bar{A} + \bar{B}).(A + B)$
3. $\overline{(A.\bar{B} + \bar{A}.B)}$
4. $\overline{(A.B)}.\overline{(\bar{A}.\bar{B})}$

Select the correct answer using the code given below:

a. 1 and 2 only
b. 2 and 3 only
c. 1 and 3 only
d. None of the above

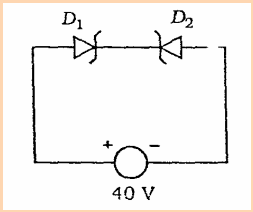
89.



In the given circuit, the output Y equals which one of the following?

a. $A + B$
b. $\bar{A}B + A\bar{B}$
c. AB
d. $\bar{A} + \bar{B}$

90.



In the circuit given above, the Zener diode D1 has a reverse breakdown voltage of 100 V and reverse saturation current of 25 μA. The corresponding values for D2 are

50 V and 50 μA. What is the current in the circuit?

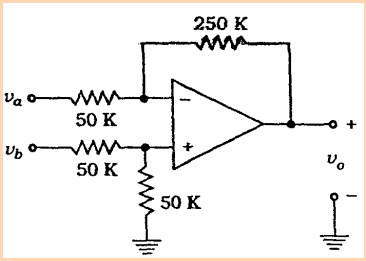
a. $25\,\mu A$ anticlockwise

b. $25\,\mu A$ clockwise

c. $50\,\mu A$ anticlockwise

d. $50\ \mu A$ clockwise

91.



What is the output voltage v_o of the given circuit?

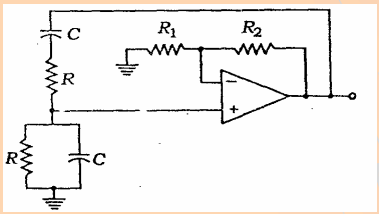
a. $-5v_a + 2.5v_b$

b. $-5v_a + 3v_b$

c. $-2.5v_a + 2.5v_b$

d. $-2.5v_a + 3v_b$

92.



Consider the following statements in respect of the Wien bridge oscillator shown in the figure above:

1. For R = 1 kiloohm

$$C = \left(\frac{1}{2\pi}\right)\mu F,\ f = 1kHz$$

2. For R = 3 kiloohms

$$C = \left(\frac{1}{18\pi}\right)\mu F,\ f = 3kHz$$

Which of the statements given above is/are correct?

a. 1 only

b. 2 only

c. Both 1 and 2

d. Neither 1 nor 2

93. Consider the following statements:

1. Wien bridge oscillator is suitable for generating 1 kHz.
2. Colpitts oscillator is suitable for generating 1 MHz.

Which of the statements given above is/are correct?

a. 1 only

b. 2 only

c. Both 1 and 2

d. Neither 1 nor 2

94. A sinusoidal signal of 100 Hz is applied to an amplifier. The output current is $i_0 = 20\sin(628t) + 2\sin(1256t) + 1\sin(1256t)$

What is the approximate percentage increase in power due to distortion?

a. 1.15

b. 1.25

c. 1.30

d. 1.50

95. A resistance R_f is connected across the collector and base of a BJT amplifier of gain –A(A>0). The input impedance of the amplifier will consist of transistor internal resistance $r_{b'e}$ shunted by which one of the following?

a. $R_f(1+A)$

b. $R_f(1-A)$

c. $R_f/(1+A)$

d. $R_f/(1-A)$

96. A negative feedback amplifier with open-loop gain $\dfrac{-A_0}{1+j\dfrac{\omega}{\omega_0}}$ $A_0 > 0$ and feedback factor $\beta(>0)$ will have a 3 dB cut-off at what frequency?

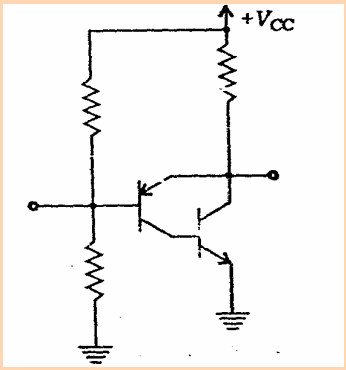
a. $\omega_0 A_0 \beta$

b. $\omega_0(1+A_0\beta)$

c. $\omega_0/(1+A_0\beta)$

d. $\omega_0/(1-A_0\beta)$

97.



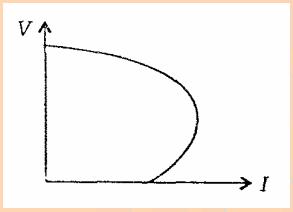
What is the transistor combination shown in the figure given above?

a. A Darlington pair
b. A complementary pair
c. It effectively acts as a single p-n-p transistor
d. If effectively acts as a single n-p-n transistor

98. What is the effect of cascading the amplifier stages?

a. To increase the voltage gain and increase the bandwidth
b. To increase the voltage gain and reduce the bandwidth
c. To decrease the voltage gain and increase the bandwidth
d. To decrease the voltage gain and reduce the bandwidth

99.



The graph shown above represents which characteristic of a d.c. shunt generator?

a. Internal characteristic
b. External characteristic
c. Open-circuit characteristic
d. Magnetic characteristic

100. When is the mechanical power developed by a d.c. motor maximum?

a. Back e.m.f is equal to applied voltage
b. Back e.m.f is equal to zero
c. Back e.m.f is equal to half the applied voltage
d. None of the above

101. Match List-I with List-II and select the correct answer using the code given below the Lists:

List – I (DC machine quantity)

A. Developed power
B. Torque
C. Generated e.m.f.
D. Speed

List – II (Relation)

1. $\propto N\phi$
2. $\propto E_b I_a$
3. $\propto E_b / \phi$
4. $\propto I_a \phi$

Codes:

a. A2, B4, C1, D3
b. A3, B1, C4, D2
c. A2, B1, C4, D3
d. A3, B4, C1, D2

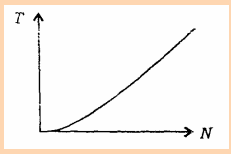
102. A shunt generator has a critical field resistance of 200 Ω at a speed of 800 r.p.m. If the speed of the generator is increased to 1000 r.p.m., what is the change in the critical field resistance of the generator?

a. Decreases to 160Ω
b. Remains the same at 200Ω
c. Increases to 250Ω
d. Increases to 312.5Ω

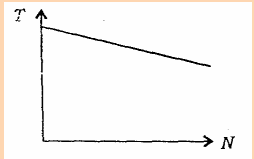
103. Which one of the following curves represents the speed-torque characteristic of a d.c. series motor?

a.

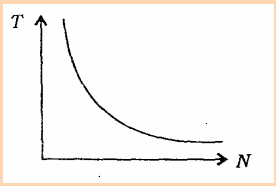
b.



c.



d.



104. Match List – I with List – II in respect of synchronous machines and select the correct answer using the code given below the List:

List-I (Machine characteristic)

A. Open-circuit characteristic

B. V-curve

C. Internal Characteristic

D. Inverted V-curve

List-II (Quantity)

1. p.f. vs. I_f
2. E_a vs. I_a
3. E_g vs. I_f
4. I_a vs. I_f

Code:

a. A3, B1, C2, D4

b. A2, B4, C3, D1

c. A3, B4, C2, D1

d. A2, B1, C3, D4

105. Which of the following conditions are to be satisfied for proper synchronization of alternators?

1. Equal terminal voltage
2. Same frequency
3. Same phase sequence
4. Same kVA rating
5. Same phase displacement

Select the correct answer using the code given below:

a. 1, 3, and 4 only

b. 1, 2, 4 and 5 only

c. 2, 3, 4 and 5 only

d. 1, 2, 3 and 5 only

106. If the excitation of a 3-phase alternator operating on infinite bus bars is changed, which one of the following shall alter?

a. Active power of machine

b. Reactive power of machine

c. Terminal voltage of machine

d. Frequency of machine

107. The stator of a 3-phase, 6-pole a.c. machine has 45 slots. The stator winding has 45 coils with a coil span of 6 slots. What type of winding will be selected for this machine?

a. Double-layer, fractional slot, short-pitched winding

b. Single-layer, fractional slot, short-pitched winding

c. Single-layer, integral slot, full-pitch winding

d. Double-layer, fractional slot, full-pitch winding

108. When are eddy-current losses in a transformer reduced?

a. If laminations are thick

b. If the number of turns in primary winding is reduced

c. If the number of turns in secondary winding is reduced

d. If laminations are thin

109. Why is a centrifugal switch used in a single-phase induction motor?

a. To protect the motor from overloading

b. To improve the starting performance of the motor

c. To cut off the starting winding at an appropriate instant

d. To cut in the capacitor during running conditions

110. What is the operating slip of a 400 V, 50 Hz, 6-pole, 3-phase induction motor, while the speed is 936 r.p.m. with a 400 V, 45 Hz, 3-phase supply?

a. 0.036

b. 0.064

c. 0.025

d. 0.075

111. A 3-phase slip-ring induction motor having negligible stator impedance drives a constant torque load. If an additional resistance is included in the rotor circuit, what does the motor experience?

a. Increase in both the stator current and the slip

b. No change in the stator current and increase in the slip

c. Increase in the stator current and no change in the slip

d. Decrease in the stator current and increase in the slip

112. Breakdown torque in a 3-phase induction motor of negligible stator impedance is

a. Directly proportional to rotor resistance
b. Inversely proportional to rotor resistance
c. Directly proportional to rotor leakage reactance
d. Inversely proportional to rotor leakage reactance

113. Match List – I with List – II and select the correct answer using the code given below the Lists:

List-I

(Controller)

A. Chopper-controlled resistance in the rotor
B. Sub-synchronous converter-cascade in the rotor circuit of an induction motor
C. 3-phase a.c. voltage controller
D. Cyoloconverter

List-II

(Type of load)

1. Very low speed, high-power reversible drive
2. Centrifuges in sugar industry
3. Blowers and compressors
4. Loads requiring good starting performance

Code:

a. A3, B4, C2, D1
b. A3, B4, B1, D2
c. A4, B3, C1, D2
d. A4, B3, C2, D1

114. A cyclo-converter-fed induction motor drive is most suitable for which one of the following?

a. Compressor drive
b. Machine tool drive
c. Paper mill drive
d. Cement mill drive

115. A large d.c. motor is required to control the speed of blower from a 3-phase a.c. source. What is the most suitable a.c. to d.c. converter?

a. 3-phase fully controlled bridge converter
b. 3-phase fully controlled bridge converter with free wheeling diode
c. 3-phase half-controlled bridge converter
d. A pair of 3-phase converter in sequence control

116. A single-phase full-bridge inverter is connected to a load of 2.4Ω. The d.c. input voltage is 48 V. What is the r.m.s. output at fundamental frequency?

a. $\frac{4\times 48}{\sqrt{2}\pi}V$
b. $\frac{2\times 48}{\sqrt{2}\pi}V$
c. $\frac{4\times 48}{\pi}V$
d. $\frac{2\times 48}{\pi}V$

117. A buck regulator has an input voltage of 12 V and the required output voltage is 5 V. What is the duty cycle of the regulator?

a. 5/12
b. 12/5
c. 5/2
d. 6

118. A balanced 3-phase induction motor runs at slip S. If ω_s is its synchronous speed, what is the relative speed between the stator m.m.f. and rotor m.m.f.?

a. $S\omega_s$
b. $(1-S)\omega_s$
c. ω_s
d. Zero

119. Maximum efficiency of modern coal-fired steam-raising thermal power plants is restricted to about 0.35 (a low value), mainly because of

a. Low alternator efficiency
b. High energy loss in boilers
c. Low steam turbine mechanical efficiency
d. High energy loss from turbine exhaust to condenser

120. Mho relay is usually employed for the protection of

a. Short lines only
b. Medium lines only
c. Long lines only
d. Any line