ELECTRICAL ENGINEERING

PAPER–II

1. A thermal generating station has an installed capacity of 15 MW and supplies a daily load of 10 MW for 12 hours and 5 MW for remaining 12 hours. The plant capacity factor for this station is
   a. 1
   b. 0.75
   c. 0.67
   d. 0.5

2. Power output (in kW) of a hydro power station is equal to (Q = discharge in m^3/s, q overall. efficiency of the plant, h = head in m, ω = density of water)
   a. $\frac{75}{0.736}\frac{Q\omega h}{\eta}$
   b. $\frac{0.736}{75}Q\omega h\eta$
   c. $\frac{750}{0.736}\frac{Q\theta\eta}{h}$
   d. $\frac{0.736}{750}\frac{Qh\eta}{\omega}$

3. Consider following moderators used in nuclear reactors:
   1. Graphite
   2. Beryllium
   3. Heavy water

   Their correct sequence in increasing order of their neutron absorption cross-sections is
   a. 1, 3, 2
   b. 2, 1, 3
   c. 3, 1, 2
   d. 3, 2, 1

4. 3-phase alternator rated at 50 MVA, 22 kV has a synchronous reactance per phase of 5 Pu on its thermal rating. The pu value of this reactance on a base of 100 MVA and 220 kV is
   a. 25 pu
   b. 12.5 Pu
   c. 1 pu
   d. 0.1 pu

5. A short transmission line has a total resistance of 2Ω, reactance of 3Ω, current of 125 A and pf of 0.8. Regulation in percentage is equal to
   a. 1.9
   b. 0.38
   c. 3.8
   d. 0.19

6. A star-connected 3-phase 11 kV. 25 MVA alternators with its neutral grounded through a 0.033 Pu reactance (based on the alternator rating) has positive negative and zero-sequence reactance's of 0.2 pu, 0.1 pu and 0.1 pu respectively. A single line to ground fault on one of its terminals would result in a fault current of
   a. 150 MVA
   b. 125 MVA
   c. 100 MVA
   d. 50 MVA

7. Compared to Gauss-Seidel method, Newton-Raphson method takes
   a. less number of iterations and more time per iteration
   b. less number of iterations and less time per. iteration
   c. more number of iterations and more time per iteration
   d. more number of iterations and less time per iteration

8. An infinite bus of 1 Pu is fed from a synchronous machine having E = 1.1 Pu. If the transfer reactance between them is 0.5 pu, the steady stat? power limit will be
   a. 1.1 pu
   b. 0.5 pu
   c. 2.2 Pu
   d. 1 pu

9. The positive sequence current for a L - L fault of a 2 kV system is 1400 A, and corresponding current for a L - L - G fault

is 2220 A. The zero sequence impedance of the system is

a. 62.75 Ω

b. 4.5275 Ω

c. 5.275 Ω

d. 0.5275 Ω

10. The inertia constant of a 100 MVA, 50 Hz, 4-pole generator is 10 MJ/MVA. If the mechanical input to the machine is suddenly raised from 50 MW to 75 MW the rotor acceleration will be equal to

a. 225 electrical degree/s^2

b. 22.5 electrical degree/s^2

c. 125 electrical degree/s^2

d. 12.5 electrical degree/s^2

11. A surge of 260 kV traveling in a line of natural impedance of 500Ω arrives at a junction with two lines of natural impedances of 250Ω and 50Ω respectively. The voltage transmitted in the branch lines is

a. 400kV

b. 260 kV

c. 80 kV

d. 40 kV

12. Insulation coordination of UHV lines (above 500 kV) is, done based on

a. lightning surges

b. lightning surges and switches surges

c. switching surges

d. None of the above

13. The number of discs in a string of insulators for 400 kV ac overhead transmission line lies in the range of

a. 32 to 33

b. 22 to 23

c. 15 to 16

d. 9 to 10

14. The insulation resistance of a single-core cable is 200 MΩ/km. The insulation resistance for 5 km length is

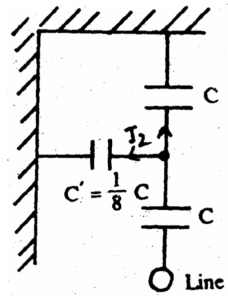
a. 40 MΩ

b. 1000 MΩ

c. 200MΩ

d. 8 MΩ

15.



The equivalent capacitor arrangement of a two-string insulator is shown in the above figure. The maximum voltage that each unit can withstand should not exceed 17.5 kV. The line-voltage of the complete string is

a. 17.5 kV

b. 33 kV

c. 35 kV

d. 37.3 kV

16. Consider the following statements:

1. By using bundle conductors in an overhead line, the corona loss is reduced.
2. By using bundle conductors, the inductance of transmission line increases and capacitance reduces;
3. Corona loss causes interference in adjoining communication lines.

Which of these statements are correct?

a. 1 and 2

b. 2 and 3

c. 1 and 3

d. 1, 2 and 3

17. Which one of the following sequences of operations represents the rated operating duty cycle of a circuit breaker?

(O - open; C - close; t = 3 sec.; T = 3 mm.)

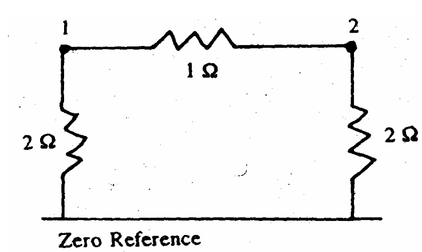
a. O – t - C0 – T - CO

b. O – CO – t – CO – T – C

c. O – C – T – OC – T

d. O – CO – T – CO – T - C

18.



With the usual notation, the impedance matrix for the system shown in the above figure is

a. $\begin{bmatrix} 3 & 1 \\ 1 & 3 \end{bmatrix}$

b. $\begin{bmatrix} 3/8 & -1/8 \\ -1/8 & 3/8 \end{bmatrix}$

c. $\begin{bmatrix} 6/5 & 4/5 \\ 4/5 & 6/5 \end{bmatrix}$

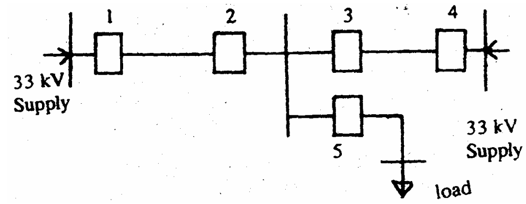
d. $\begin{bmatrix} 5 & 4 \\ 4 & 5 \end{bmatrix}$

19. A 3-phase circuit breaker is rated at 2000 MVA, 33 kV; its making current will be
    a. 35 kA
    b. 49 kA
    c. 70 kA
    d. 89 kA

20. Line trap at coupling capacitors are used for carrier current protection in which
    a. line trap has high impedance to 50 Hz signal but low impedance to carrier current signal whereas a coupling capacitor has low impedance to 50 Hz signal but high impedance to carrier signal
    b. line trap has low impedance to 50Hz signal but high impedance to carrier current signal, whereas a coupling capacitor has high impedance to 50 Hz signal but low impedance to carrier signal
    c. both line trap and coupling capacitor have low impedance to 50 Hz signal but high impedance to carrier current signal
    d. both line trap and coupling capacitor have high impedance to 50 Hz signal but low impedance to carrier current signal

21. Four alternators, each rated at 5 MVA, 11 kV with 20% reactance are working in parallel. The short-circuit level at bus bars is
    a. 6.25 MVA
    b. 20 MVA
    c. 25 MVA
    d. 100 MVA

22.



The distribution system shown in the above figure is to be protected by over-current system of protection. For proper fault discrimination, directional over-current relays will be required at locations
    a. 1 and 4
    b. 2 and 3
    c. 1, 4 and 5
    d. 2, 3 and 5

23. If the fault current is 2 kA, the relay setting is 50% arid the CT ratio is 400/5, then plug setting multiplier will be
    a. 25
    b. 15
    c. 50
    d. 12.5

24. A three-phase 11/66 kV, delta/star transformer, protected by Merz-price scheme has CT ratio of 400/5 on L.T. side. Ratio of C.T. on H.T. side will be equal to
    a. 1 : 23
    b. 23 : 1
    c. 23 : 3
    d. $\sqrt{3}$: 23

25. Which one of the following statements in respect of HVDC transmission line is not correct?
    a. the power transmission capability of bipolar line is almost the same as that of single circuit ac line
    b. HVDC link line can operate between two ac systems whose frequencies need not be equal
    c. There is no distance limitation for HVDC transmission by UG cable
    d. Corona loss is much higher in HVDC transmission line

26. In a 3-phase converter used in HVDC transmission, the three anodes conduct sequentially. Due to overlap caused by the circuit inductance, two anodes conduct simultaneously during the overlap period The output voltage waveform during this period is the

a. voltage of the 1st anode, because the 2nd anode has not completely taken over
b. mean of the two anode voltages, as they conduct together
c. voltage of the 2nd anode, because the voltage of this anode is greater than that of the 1st
d. sum of the 1st and the 2nd anode voltages, because both the anodes are conducting

27. If, for a given alternator in economic operation mode, the incremental cost is given by (0.012P +8) Rs./mwh, dP_L / dP = 0.2 and plant λ = 25, then the power generation is
a. 1000 MW
b. 1250 MW
c. 750 MW
d. 1500 MW

28. Load frequency control uses
a. proportional controllers alone
b. integral controllers alone
c. both proportional and integral controllers
d. either proportional or integral controllers

29. Two generators rated at 200 MW and 400 MW are operating in parallel. Both the governors have a drop of 4%, when the total load is 300 MW They share the load as (suffix '1' is used for generator 200 MW and suffix '2' is used for generator 400 MW)
a. P_1 = 100 MW and P_2 = 200MW
b. P_1 = 150 MW and P_2 = 150 MW
c. P_1 = 200 MW and P_2 = 100 MW
d. P_1 = 200 MW and P_2 = 400 MW

30. Assertion (A): dc series motors are used to drive electric locomotives.
Reason (R): dc series motor develop high torque at high speed.
a. Both A and Rare true and R is the correct explanation of A
b. Both A and R are 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

31. Assertion (A): If an ac-voltage regulator is feeding and R — L ked, the minimum firing angle $\alpha_{\min} = \phi$ where $\phi = \tan^{-1}(\omega L / R)$.
Reason (R): In an ac voltage regulator feeding R — L load, control is lost if $\alpha_{\min} < \phi$.
a. Both A and Rare true and R is the correct explanation of A
b. Both A and R are 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

32. Assertion (A): A 64 input MUX can be built by using eight 8 input multiplexers
Reason (R): Any six variable functions can always be implemented by a multiplexer with six address lines.
a. Both A and Rare true and R is the correct explanation of A
b. Both A and R are 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

33. Assertion (A): The input resistance of a silicon JFET is of the order of tens or huntlreds of megaohms.
Reason (R): The gate-source junction of JFET is a reverse biased silicon diode and hence only a very small leakage current flows through the gate.
a. Both A and Rare true and R is the correct explanation of A
b. Both A and R are 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

34. Assertion (A): The per unit impedance of a synchronous machine is the reciprocal of short-circuit ratio of the machine
Reason (R): For the computation of the short-circuit ratio, the field excitation to generate rated voltage on open-circuit should be read from the open-circuit characteristic of the machine.
a. Both A and Rare true and R is the correct explanation of A
b. Both A and R are 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

35. Assertion (A): The switching function F = Σ(0 - 3, 12 - 15) does not have a unique minimal sum of product form.

Reason (R) The switching function F = Σ(0 - 3, 7, 12 - 15) has cyclic prime implicants.

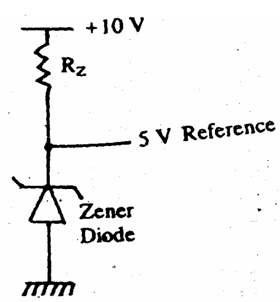
a. Both A and Rare true and R is the correct explanation of A
b. Both A and R are true but R is NOT the correct explanation of A
c. A is true but R is false
d. A is false but R is true

36. Assertion (A): The maximum possible output frequency of the basic series inverter, using SCR's T_1 and T_2 is limited to the resonant frequency.

Reason (R): Thyristor T_2 can only be fired when thyristor T_1 is OFF and vice-versa, otherwise a dead short-circuit will take place across the dc supply.

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

37.



A 5 V reference is drawn from the circuit shown in the above figure. If the zener diode is of 5 mV and 5 V, then R_Z will be

a. 50 Ω
b. 500 Ω
c. 5000 Ω
d. 50000 Ω

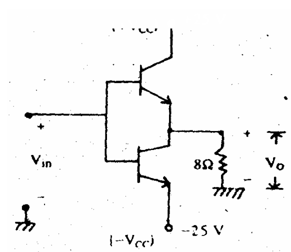
38. A voltage of 200 cos 100 t is applied to a half-wave rectifier with a load resistance of 5 kΩ. The rectifier is represented by an ideal diode in series with a resistance of 1 kΩ. The maximum value of current, dc component of current and rms value of current will be respectively

a. 33.33 mA, 10.61 mA and 16.67 mA
b. 22.22 mA, 8.61 mA and 12.3mA
c. 28.33 mA, 14.61 mA and 13.33 mA
d. 40 mA, 20 mA and 25 mA

39. The transition capacitance of a diode is 1 nF and it can withstand reverse potential of 400 V.A capacitance of 2 nF which can withstand a reverse potential of 1 kV is obtained by connecting

a. two 1 nF diodes in parallel
b. six parallel branches with each branch comprising three 1 nF diodes in series
c. two 1 nF diodes in series
d. three parallel branches with each branch comprising six 1 nF diodes in series

40.



[redacted] push-pull amplifier shown in the above figure. If the peak output voltage V_O is 16 V, the power drawn from the dc source would be

a. 10 W
b. 16 W
c. 20 W
d. 32 W

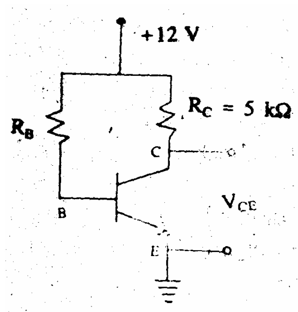
41. An FET source follower circuit has gm of 2 m℧ band r_d of 50 k℧. If the source resistance R_S is 1 kΩ, the output resistance of the amplifier will be

a. 330 Ω
b. 450 Ω
c. 500 Ω
d. 1 k Ω

42. If the counters of INTEL 8253 (programmable interval timer) are loaded with a hew value while counting, then

a. the counter will stop counting
b. the counter will ignore the new. loaded value d continue to count as per previous loaded value
c. the counter will start counting backwards
d. counting will restart from the new value of count which has been loaded

43.



Assume V_{BE} = 0.7 V and β = 50 for the transistor in the circuit shown in the above figure. For V_{CE} = 2 V, the value of R_B is

a. 200 kΩ

b. 242 kΩ

c. 283 kΩ

d. 300 kΩ

44. In the shunt series feedback amplifier, the basic amplifier and the feedback network are parallel connected at the input and series connected at the output. The signal sampled and the summing done will be respectively

a. current and current

b. current and voltage

c. voltage and current

d. voltage and voltage

45. A transistor amplifier has a voltage gain of 50, input resistance of 1 kΩ and output resistance of 40 kΩ. The amplifier is now provided 10% negative voltage feedback in series with the input. With feedback, the voltage gain, input resistance and output resistance will be respectively

a. 8,7 kΩ and 3 kΩ

b. 8.33, 6 kΩ and 6.66 kΩ

c. 5.33, 8.33 kΩ and 8.66 kΩ

d. 6.66, 8.86 kΩ and 6.66 kΩ

46. In an inverting amplifier, the two input terminals of an ideal Op-amp are at the same potential because

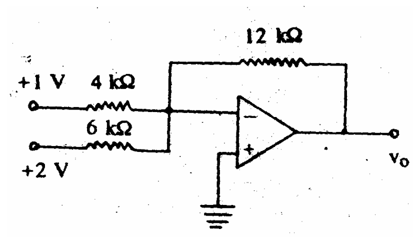
a. the two input terminals are directly shorted internally

b. the input impedance of the Op-amp is infinity

c. CMRR is infinity

d. the open-loop gain of the Op-amp is infinity

47.



In the circuit shown in the above figure, the value of output 'v_o' is

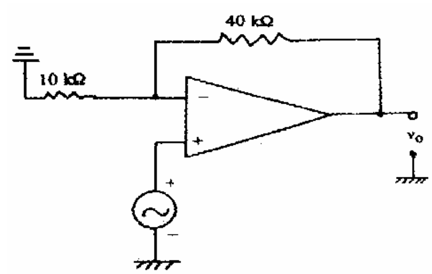
a. + 3 V

b. - 3 V

c. - 7 V

d. + 7 V

48.



The Op-amp in the above circuit shows a unity-gain bandwidth of 1 MHz and a dominant pole at 10 Hz. The bandwidth of the non-inverting amplifier will be

a. 10 MHz

b. 1 MHz

c. 250 kHz

d. 200 kHz

49. The speed of rotation of a shaft is measured by using a 120 teeth wheel and an inductive pick up. The reading on a digital frequency meter is 3000 with a gating period of 10 micro-seconds. The shaft speed would be

a. 750 rpm

b. 1500 rpm

c. 3000 rpm

d. 3600 rpm

50. Consider the following statements

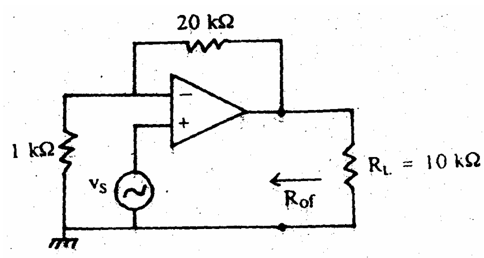
1. A NAND gate is equivalent to an OR gate with its inputs inverted.
2. A NOR gate is equivalent to an AND gate with its inputs inverted.
3. A NAND gate is equivalent to an OR gate with its outputs inverted.
4. A NOR gate is equivalent to an AND gate with its output inverted.

Which of these statements are correct?

a. 1 and 2

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

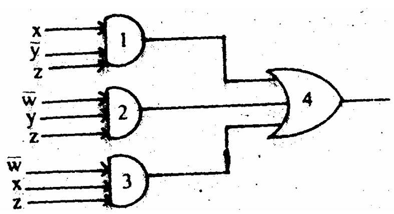
51.



An Op-amp with an open-loop gain of 10,000. R_m =2 kΩ and R_O = 5000 is used in the non-inverting configuration as shown in the above figure. The output resistance R_{of} is

a. 250.5 Ω
b. 21 Ω
c. 2 Ω
d. 0.998 Ω

52.



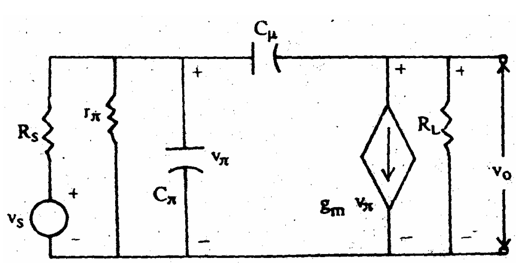
Which one of the gates labelled 1, 2, 3 and 4 in the network shown in the above figure is redundant?

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

53. In a JK flip-flop, J is connected to Q and K is connected to Q outputs. The JK flip-flop converrts into a

a. R — S flip-flop
b. D flip-flop
c. T flip-flop
d. clocked R — S flip-flop

54.



Consider the following statements:

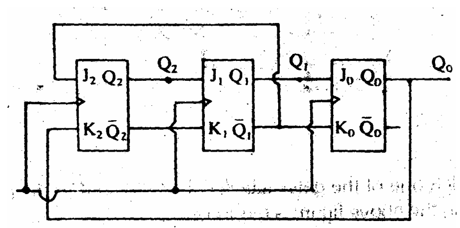
The circuit in the above figure is the high frequency equivalent of a CE amplifier, lithe upper cut-off frequency ω_H = 1/ T where T = RC, then

1. $R = R_S = r_\pi$
2. $R = R_S$ parallel r_π
3. $C = C_\pi + C_\mu$
4. $C = C_\pi + C_\mu (1 + g_m R_L)$

Which of these statements are correct?

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

55.



The counter shown in the above figure has initially Q_2Q_1 Q_0 = 000. The status of Q_2 Q_1 Q_0 after the first pulse is

a. 001
b. 010
c. 100
d. 101

56. A system which accepts as M-bit word and establishes the state "1" on one and only one of 2^M output lines is called

a. decoder
b. demultiplexer
c. multiplexer
d. encoder

57. The number of comparators needed in a 4-bit flash-type A/D converter is

a. 32
b. 15
c. 8
d. 4

58. in 8085 microprocessor whenever the POP H instruction is executed

a. data bytes in the HL pair are stored in the stack
b. two data bytes at the top of the stack are transferred to the HL pair

c. two data bytes at the top of the stack are transferred to PC

d. two data bytes horn the HL registers that were previously stored on the stack on transferred back to the HL pair

59. A 3-bit resistance ladder D/A (R-2R network) has resistor values of R = 10 kΩ and 20 kΩ. If V_{ref} = 8 V. I_0 for a digital input of 111 will be

a. 0.1 mA

b. 0.2 mA

c. 0.7mA

d. 1 mA

60. Which one of the following is a correct statements in connection with commands of CMP and CPI

a. CMP takes less number of m/c cycles compared to CP1

b. CMP takes more number of m/c cycles compared to CPI

c. Both CMP and CPI take the same number of m/c cycles

d. CMP takes either less or the same number of m/c cycles as compared to CPI

61. The instruction queue length in INTEL 8086 and 8088 are

a. 6 bytes in both processors.

b. 4 bytes in both processors.

c. 4 bytes in 8086 and 6 bytes in 8088

d. 6 bytes in 8086 and 4 bytes in 8088

62. A four-bit BCD(DCBA) for numeral 9 can be decoded most economically by the logic operation

a. AD

b. ABD

c. ACD

d. $ABCD$

63. A program accesses ten continuous memory locations. The CPU will take less time if the addressing mode used is

a. direct

b. implicit

c. register indirect

d. immediate

64. Match List I (chips related to microprocessors and controllers) with List II (their function) and select the correct answer:

List I

A. 8255 A

B. 8254

C. 8259

D. i 8096

List II

1. Interrupt controller

2. Microcontroller

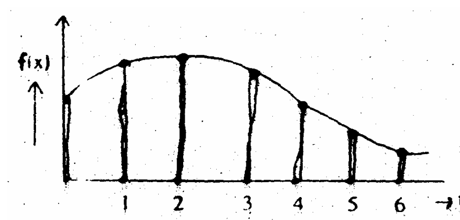
3. Counter

4. Pripheral interface

Codes;

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

65.



Consider a signal f(x) sampled at t = 0, 1, 2, 3, ……. as shown in the above figure. The expression for the sampled signal is

a. {f(x).n} where n = number of samples

b. {f(x)δ(t, n)} where δ(t, n) kronek or delta n = 0, 1,2, ………

c. {f(x).Δn} where Δ = constant equal to sample duration

d. not possible to write

66. If the clock has a frequency of 5 MHz, then the execution time for ADD memory to register instruction using based indexed relative addressing (result put in register) required is

a. 4.8 µs

b. 4.9 µs

c. 5 µs

d. 5.1 µs

67. In conventional AM super heterodyne receivers, the detectors employed to extract intelligence include

a. peak detectors

b. ratio detectors

c. phase locked loops
d. slope detectors

68. The characteristic impedance of a transmission line with series impedance Z ohms per unit length and shunt admittance Y mhos per unit length, is given by
a. $(Z+Y)^2$
b. $\sqrt{(Z.Y)}$
c. $\sqrt{(Z/Y)}$
d. $\sqrt{(Z/Y)^2}$

69. The suitable programmable counter for 8086 microprocessors is
a. 8253 chip
b. 8254 chip
c. 8259A chip
d. 8251 chip

70. 70. If two stages with noise figures F_1 and F_2 and gall-is G_1 and G_2 are cascaded, the resultant noise figure F will be
a. $F_1 + \frac{F_2 - 1}{G_1}$
b. $F_1 + \frac{F_2 - 1}{G_2}$
c. $\frac{F_1 - 1}{G_2} + F_2$
d. $\frac{F_1 - 1}{G_1} + F_2$

71. In TV systems, the modulation methods employed for video and audio signals are
a. both amplitude modulation
b. both frequency modulation
c. respectively amplitude modulation and frequency modulation
d. respectively frequency modulation and amplitude modulation

72. For an AM wave having a power of 800 W at its carrier frequency and modulation index of 90%, the power content of each side-band is
a. 81W
b. 162W
c. 200W
d. 400W

73. The signal to quantization noise ratio in an n-bit PCM system
a. depends upon the sampling frequency employed
b. is independent of the value of n
c. decreases with increasing value of n
d. increases with increasing value of n

74. A PWM signal can be generated by
a. an astable multivibrator
b. a monostable multivibrator
c. integrating a PPM signal
d. differentiating a PPM signal

75. Medium wave radio signal can be received at far off distances at night because
a. radio waves travel faster at night
b. ground wave attenuation is lower at night
c. sky wave is stronger at. Night
d. there is no fading at night

76. The fetch and execute instructions are repeatedly executed by the microprocessor until the power is switched OFF The microprocessor enters into a loop described by while power is on do

begin

fetch the next instruction

execute this instruction

end

These two tasks are sequential. Which one of the following microprocessors does not follow this sequence?
a. 8085
b. Z 80
c. 8086
d. 68000

77. Which one of the, following layers is the service provider for transport layer of OSI model?
a. Network layer
b. Session layer
c. Transport layer of another station
d. Physical layer

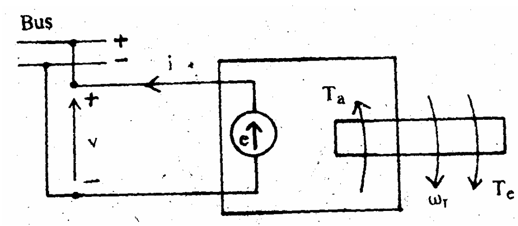
78. A 4-bit Johnson counter is initialized to 0101. Whenever the state 1011 is reached the counter is reinitialized to 0000 at the next closed active edge. Again when the state 0001 s reached, the counter is initialized back to 0101 at the next clock active edge. The cycle length of the counter is
a. 6

b. 8

c. 16

d. 32

79.



An electromechanical energy conversion device is shown in the above figure. The instantaneous values of armature induced emf, bus bar voltage and armature current are respectively e, v and i, T_e, T_a and ω_r present external torque, armature developed torque and angular velocity of shaft respectively. Assume that the given directions of parameters in the figure are positive. If the device is working in generating mode then

a. all parameters will have the positive direction

b. e, v, T_e and ω_r will have negative direction and others will remain in positive direction

c. T_a and i will have negative direction and others will remain in positive direction

d. T_e and ω_r will have negative direction and others will remain in positive direction

80. A torroidal ferromagnetic ring is uniformly wound with copper wire of certain turns. A dc voltage V1 is applied across the winding to cause a uniform flux density in the ring. If the linear dimensions of the ring, number of turns and length of a mean turn are doubled without changing the gauge of the wire, the dc voltage required to be applied across the new winding to produce the same flux density will be

a. $V_1/2$

b. V_1

c. $2V_1$

d. $4V_1$

81. In a 3-phase star connected generator, if the fundamental and third harmonic rms voltages in each phase are respectively V_1 and V_3, the line voltage of he generator will be

a. $\sqrt{3\left(V_1^2+V_3^2\right)}$

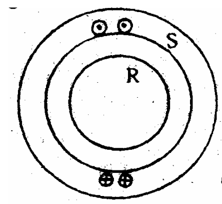
b. $\sqrt{3V_1}$

c. $\sqrt{3}\left(V_1+\frac{V_3}{3}\right)$

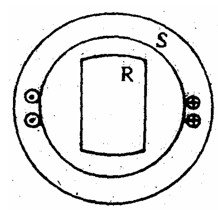
d. $\sqrt{V_1^2+\frac{V_3^2}{3}}$

82.

1.



2.



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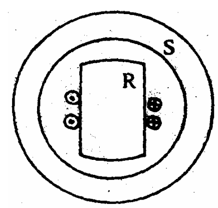


Three singly-excited electromagnetic structures are shown in the above figures labelled 1, 2 and 3 (R - Rotor, S - Stator). The reluctance torque can be developed in

a. 1 and 3

b. 1 alone

c. 2 and 3

d. 2 alone

83. Consider the following statements regarding the magnetisation characteristics of a dc generator:

1. It represents the variation of field flux with field current.
2. Variation of open-circuit terminal voltage with field current is independent of speed.
3. It is non-Linear from zero to rated field current.
4. It helps to determine critical field resistance at a given period.

5. It always starts from the origin.

Which of these statements are correct?

a. 1 and 4

b. 1, 2 and 5

c. 2, 3 and 4

d. 3 and 5

84. If two 8-pole & machines of identical armatures are wound one with lap winding arid the other with wave winding, then

a. wave wound machine will have more rated current and more voltage

b. lap wound machines will have more rated voltage and more current

c. lap wound machine will have more rated voltage and less current

d. wave wound machine will have more rated voltage and less current

85. If the speed of a dc motor increases with load torque, then it is a

a. series motor

b. permanent magnet motor

c. differentially compounded motor

d. cumulatively compounded motor

86. Full-load voltage regulation of a power transformer is zero, when power factor of the load is neat

a. unity and leading

b. zero and leading

c. zero and lagging

d. unity and lagging

87. In a single-phase transformer, the magnitude of leakage reactance is twice that of resistance of both primary and secondary. With secondary short-circuited, the input power factor is

a. $1/\sqrt{2}$

b. $1/\sqrt{5}$

c. $2/\sqrt{5}$

d. 1/3

88. If a sinusoidal voltage source is connected to a power transformer, its no-load current would be

a. sinusoidal and lagging the voltage by 90°

b. sinusoidal and lagging the voltage by less than 90°

c. rich in third harmonic and its fundamental would lag the voltage by 90°

d. rich in third harmonic and its fundamental would lag the voltage by less than 90°

89. The zero power factor characteristic for the Potier’s diagram can be obtained by loading the alternator using

a. lamp load

b. synchronous motor

c. water load

d. dc motor

90. If all other requirements for parallel operation of transformer are fulfilled, which one of following pairs of three-phase transformers, with given VECTOR GROUPS, can be operated in parallel?

a. Y d 1 and Yy 0

b. Y d 1 and Dy 11

c. Dd 6 and Dy 1

d. Dd 0 and Dy 11

91. When short-circuit test on a transformer is performed at 25 V, 50 Hz, the drawn current ‘I_1’ is at a lagging p.f. angle of ϕ_1. If the test is performed at 25 V, 25 Hz and the drawn current “I_2’ is at a lagging p.f. angle of ϕ, then

a. $I_2 > I_1$ and $\phi_2 < \phi_1$

b. $I_2 > I_1$ and $\phi_2 < \phi_1$

c. $I_2 < I_1$ and $\phi_2 > \phi_1$

d. $I_2 < I_1$ and $\phi_2 > \phi_1$

92. A synchronous motor with negligible armature resistance runs at a load angle of 20° at the rated frequency. If supply frequency is increased by 10%, keeping other parameters constant, the new load angle will be

a. 16°

b. 18°

c. 20°

d. 22°

93. A synchronous motor is running from an infinite bus of voltage V_t in steady-stat, at about 50% of its rated load with a power-angle δ_1, between V_t and E_f (induced voltage). The load is suddenly decreased to 25%. E_f attains its new steady-state power-angle δ_2 with V_t by initially,

a. falling behind and making a complete rotation

b. advancing and making a complete rotation

c. falling behind, followed by oscillation about δ_2

d. advancing, followed by oscillation about δ_2

94. The two-reaction phasor diagram of a salient-pole synchronous generator is considered, where

I_a = armature current per phase, X_1 = armature leakage reactance per phase, X_d = direct-axis synchronous reactance, X_q = quadrature-axis synchronous reactance and V = generator terminal voltage, taken as reference.

The voltage in phase with the direct-axis will be the phasor-sum of

a. $V + I_a r_a + I_a X_1$

b. $V + I_a r_a + I_a X_d$

c. $V + I_a r_a + I_a X_q$

d. $V + I_a r_a + I_a(X_d + X_q)$

95. Consider the following statements : The syunchronous generators used in thermal power stations have

1. cylindrical rotors
2. slip rings and brushes
3. laminated rotor
4. stator slots in multiples of 6
5. 3-phase star connected stator windings

Which of these statements are correct?

a. 1, 2, 3 and 4

b. 1, 2, 3 and 5

c. 3, 4 and 5

d. 1, 2, 4 and 5

96. Match List I with List II and select the correct answer:

List I

A. Single-phase inductor motor

B. 3-phase slip ring induction motor

C. 3-phase squirrel cage induction motor

List II

1. Rotor resistance starting
2. Not self-starting
3. Auto-transformer starting

Codes;

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

97. A 3-phase induction motor is driving a content torque load of 1 Pu at 5% slip. It has a maximum torque of 2 Pu at 10% slip. Torque-speed variation in stable zone is assumed to be linear. For the stable operation of the motor, the minimum pu supply volt- age is approximately

a. 0.25

b. 0.50

c. 0.707

d. 0.80

98. Slip test is performed to determine

a. Slip

b. direct axis reactance and quadrature axis

c. positive sequence reactance and negative sequence reactance

d. sub-transient reactance

99. Match List I (methods of full-load regulation of 25 MVA alternator at 0.8 Power factor lagging) with list II (% regulation):

List I

A. emf

B. mmf

C. ZPF

List II

1. 13%
2. 18%
3. 32%

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

100. 100. As compared to DOL starting, a cage induction motor with star-delta starting shall have

a. more starting torque

b. more starting time

c. reduced starting current

d. smoother acceleration

101. The speed of a 3-phase induction motor is controlled from 1 pu to 2 pu using a variable frequency inverter. The equivalent circuit parameter most likely to vary is

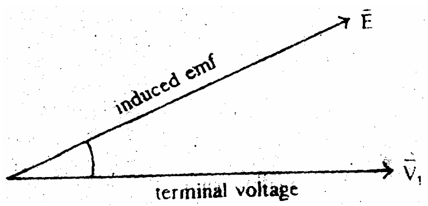
a. stator leakage inductance

b. rotor leakage inductance

c. magnetizing inductance

d. core loss resistance

102.



The phasor diagram of a synchronous machine connected to an infinite bus is shown i above figure The machine is acting as a

a. generator and operating at a lagging power factor
b. generator and operating at a leading power factor
c. motor and operating at a leading power factor
d. motor and operating at a lagging power factor

103. Which one of following statements regarding a capacitor start, capacitor run single-phase induction motor is correct?

a. One of the capacitors is in the circuit during starting and both are in the circuit during running
b. Both the capacitors are in the circuit during starting and one of them is in the circuit during running
c. Both the capacitors are in the circuit during starting and running
d. One of the capacitors is in the circuit during starting and the other is in the circuit during running

104. 'Crawling' is an in4qction motor is due to

a. time harmonics in supply
b. slip ring rotor
c. space harmonics produced y winding currents
d. insufficient starting torque

105. A two-phase servomotor develops maximum torque at

a. forward speed of one-half of the synchronous speed
b. backward speed of one-half of the synchronous speed
c. synchronous speed
d. a speed of twice the synchronous speed

106. Static voltage equalization in series-connected SCRs is obtained by the use of

a. one resistor across the suing
b. resistors of different values across each SCR
c. resistors of the value across each SCR
d. one resistor in series with the string

107. An SCR has half cycle surge current of rating-of 3000 A for 50 Hz supply. One cycle urge current rating will be

a. 1500 A
b. 2121.32A
c. 4242.64 A
d. 6000 A

108. The correct sequence of the given devices in the decreasing order of their speeds. of operation is

a. Power BJT power MOSFET, IGBT SCR
b. IGBT, power MOSFET, power BJT, SCR
c. SCR, power BJT, IGBT, MOSFET
d. MOSFET, IGBT, power BJT, SCR

109. Match List I (SMPS topology) with List II (output voltage) and select the correct answer:

List I

A. Boost
B. Buck
C. Buck-Boost
D. Isolated Buck-Boost

List II

1. $V_O = VD$
2. $V_O = -VD/1-D$
3. $V_O = V/1 - D$
4. $V_O = VD/a(1 - D)$

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

110. Commutation overlap in the phase-controlled ac to dc converter is due to.

a. load inductance
b. harmonic content of load current
c. switching operation in the converter
d. source inductance

111. A three-pulse converter has a freewheeling diode across its load. The operating range of the converter is

a. $0° \le \alpha \le 150°$

b. $60° \le \alpha \le 120°$

c. $30° \le \alpha \le 150°$

d. $180° \le \alpha \le 360°$

112. A single-phase ‘fully controlled Iin’ commutated ac to dc converter operates as an inverter, when

a. $0° \le \alpha \le 90°$’

b. $90° \le \alpha \le 180°$

c. it supplies to a ‘back emf load

d. $90° \le \alpha \le 180°$’and there is a suitable dc source in the load circuit

113. A step up chopper is fed from a 220 V dc source to deliver a load voltage of 660 V. If the non-conduction time of the thyristor is 100 μs, the required pulse width will be

a. 100 μs

b. 200 μs

c. 220 μs

d. 660 μs

114. In a type -A chopper, given that source voltage = 100 V d, ON-period = 100 μs, OFF-period = 150 μs and load R = 2Ω, L =5 mH with back emf E = 10 V connected in series for continuities conduction, average output voltage and average output current will be respectively

a. 40V and 15 A

b. 66.66 V and 28.33 V

c. 60 V and 25 A

d. 40 V and 20 A

115. If an ac chopper is feeding an inductive load, the firing pulse to the SCR

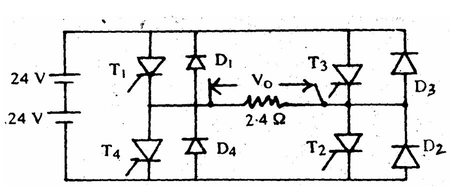
a. may have a width equal to turn ON time of the SCR

b. should be a series of pulses of short duration

c. should be a single pulse of long duration

d. should be a train of pulses of duration equal to the conduction period of the SCR

116.



Full-bridge inverter is shown in the above figure. The maximum rms output voltages ‘V_o’at fundamental frequency is

a. 24 V

b. 33.94 V

c. 43.2 V

d. 48 V

117. Which one of the following controls reduces the size of the transformer in a switch mode ac power supply?

a. Resonant control

b. bidirectional control

c. PWM control

d. Phase control

118. The output voltages e_1 and e_2 of two full-bridge inverters are added using output transformer. In order to eliminate the 5th harmonic from output voltage, the phase angle between e_1 and e_2 should be

a. π/3rad

b. it/4rad

c. π/5rad

d. π/6rad

119. In single-phase cyclo-converter, if α_1 and α_2 are the trigger angles of positive converter and negative converter, then

a. $\alpha_1 + \alpha_2 = \pi / 2$

b. $\alpha_1 + \alpha_2 = \pi$

c. $\alpha_1 + \alpha_2 = 3\pi / 2$

d. $\alpha_1 + \alpha_2 = 2\pi$

120. In a 3-phae to 1-phase cyclo-converter employing 6-pulse bridge circuit, if the input voltage is 200 V per phase the fundamental rms value of output voltage will be

a. $\frac{600}{\pi}V$

b. $300\sqrt{3}V$

c. $\frac{300\sqrt{3}}{\pi}V$

d. $\frac{300}{\pi}V$