EE-Objective-Paper-II (Set-A)

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

(A) 150V (B) 125V (C) 100V (D) 80V

Key: (D)

Exp: During operation of transformer,

$$\phi_m \propto \frac{V}{f},$$

$$\therefore \frac{V_1}{f_1} = \frac{V_2}{f_2}$$

$$\frac{100}{50} = \frac{V_2}{40}$$

$$V_2 = \frac{4000}{50} = 80\,V$$

2. A single–phase two winding transformer is designed to operate at 400/200 V, 50 Hz. If the h.v. side is now energized from a 400 V, 40 Hz source, the no–load 1.v. side voltage would be

(A) 300V (B) 250V (C) 200V (D) 150V

Key: (C)

Exp: By keeping voltage constant & frequency reduced below its rated value under no load condition, there is no change in voltage since no load test of transformer is conducted at rated voltage condition.

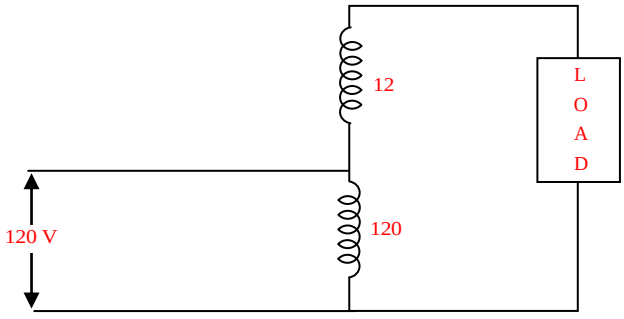
∴ No load L.V side voltage would be 200V.

3. A 100 VA, 120/12 V transformer is to be connected so as to form a step–up transformer. A Primary voltage of 120 V is applied to the transformer. What is the secondary voltage of the transformer?

(A) 1.2V (B) 12V (C) 120V (D) 132V

Key: (D)

Exp: To form a step up transformer given voltage rating, connect as auto F/F transformer with additive polarity



∴ Secondary voltage of transformer = 120+12 = 132 V

4. In a transformer, if the iron losses and copper losses are 40.5 kW and 50 kW respectively, then at what fraction of load will the efficiency be maximum ?

(A) 0.80 (B) 0.57 (C) 0.70 (D) 0.90

Key: (D)

Exp: Fraction of load at maximum efficiency condition,

$$x = \sqrt{\frac{\text{Iron Losses}}{\text{Full Load Cu} - \text{Losses}}}$$

$$x = \sqrt{\frac{40.5}{50}} = 0.90$$

5. In a transformer the core loss is 100 Watt at 40 Hz and 72 Watt at 30 Hz, then eddy current and hysteresis losses at 50 Hz respectively are

(A) 25 Watt and 105 Watt (B) 20 Watt and 100 Watt

(C) 100 Watt and 32 Watt (D) 32 Watt and 100 Watt

Key: (A)

Exp: Iron losses of transformer, $w_I = Af + Bf^2$

where $f \rightarrow$ frequency

$A, B \rightarrow$ constants

At 40 Hz, frequency,

$100 = A(40) + B(40)^2$ … (1)

At 30 Hz frequency,

$72 = A(30) + B(30)^2$ … (2)

By solving Equations (1) & (2), we get,

$A = 2.1$

$B = 0.01$

$\therefore$ Eddy current losses, $w_e = Bf_{rated}^2$

$= 0.01 \times 50^2 = 25\,W$

Hysteresis losses, $w_h = Af_{rated} = 2.1 \times 50 = 105\,W$

6. The voltage regulation of a transformer having 2% resistance and 5% reactance at full load, 0.8 pf lagging is

(A) 4.6% (B) –4.6% (C) –1.4% (D) 6.4%

Key: (A)

Exp: Voltage regulation of transformer at lagging pf

$= \{(\%R)\cos\phi + (\%x)\sin\phi\}$

$= (2 \times 0.8) + (5 \times 0.6)$

$= 4.6\%$

7. If the percentage impedances of the two transformers working in parallel are different then
(A) Transformers will be overheated
(B) Power factors of both the transformers will be same
(C) Parallel operation will not be possible
(D)Parallel operation will still be possible

Key: (D)

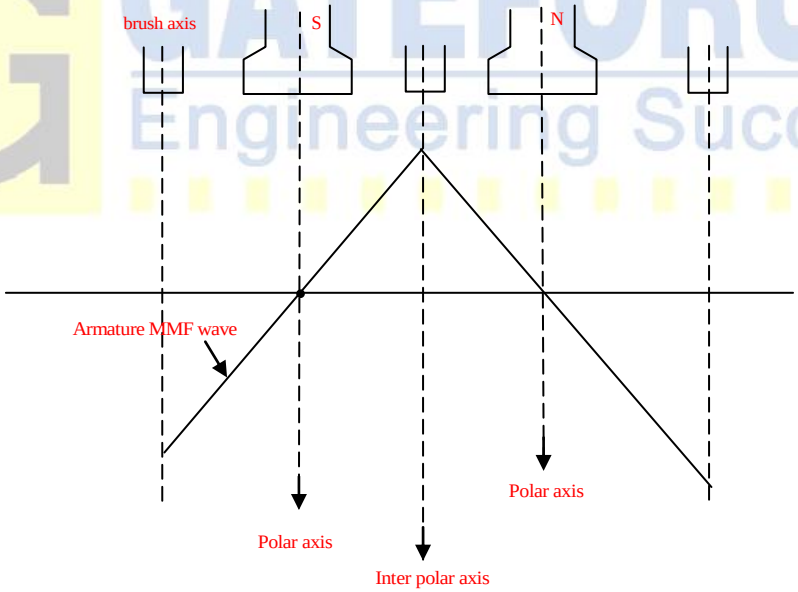
8. "A time–varying flux causes an induced electromotive force". What law does this statement represent ?
(A) Ampere's law (B) Faraday's law
(C) Lenz's law (D) Field form of Ohm's law

Key: (B)

9. Assuming a uniform distribution of current over the armature surface conductors, the shape of the resultant armature m.m.f. in space of a loaded dc machine is a symmetrical
(A) Triangular wave with its peak along the inter–polar axis
(B) Triangular wave with its peak along the pole axis
(C) Rectangular wave with its central axis coinciding with the inter–polar axis
(D) Rectangular wave with its central axis coinciding with the pole axis

Key: (A)

Exp:



Armature MMF wave is a triangular with its peak along inter polar axis.

10. A dc series motor with a resistance between terminals of 1Ω, runs at 800 rpm from a 200 V supply taking 15 A. If the speed is to be reduced to 475 rpm for the same supply voltage and current the additional series resistance to be inserted would be approximately
(A) 2.5Ω (B) 3Ω (C) 4.5Ω (D) 5Ω

Key: (D)

Exp: For a d.c series motor,

$$\frac{N_2}{N_1}=\frac{E_{b_2}}{E_{b_1}}$$

$$\frac{N_2}{N_1}=\frac{V-I_a\left(R_t+R_e\right)}{V-I_aR_t}$$

where $R_t=\left(R_a+R_{se}\right)\rightarrow$ ter min al resistance

$R_e\rightarrow$ External resistance

$$\frac{475}{800}=\frac{200-15(1+R_e)}{200-15(1)}$$

$$\frac{475}{800}=\frac{185-15R_e}{185}$$

$$\therefore R_e=5\Omega$$

11. A dc series motor of resistance 1Ω across terminals runs at 1000 rpm at 250 V taking a current of 20 A. When an additional resistance of 6Ω is inserted in series and taking the same current, the new speed would be

(A) 142.8 rpm (B) 166.7 rpm (C) 478.3 rpm (D) 956.6 rpm

Key: (C)

Exp: For a d.c series motor,

$$\frac{N_2}{N_1}=\frac{E_{b_2}}{E_{b_1}}$$

$$\frac{N_2}{N_1}=\frac{V-I_a\left(R_t+R_e\right)}{V-I_aR_t}$$

where $R_t=R_a+R_{se}=$ terminal resistance

$R_e=$ external resistance

$$\frac{N_2}{1000}=\frac{250-20(1+6)}{250-20(1)}$$

$$N_2=478.26 \text{ rpm}$$

12. Damper bars in case of Salient Pole Rotors of hydro–alternators are usually inserted in pole faces to

(A) Strengthen the excitation current of the poles

(B) Damp out the rotor oscillations during transient state owing to sudden change in load conditions

(C) Help improve the power factor of load

(D) Reduce the no–load current when load is thrown–off

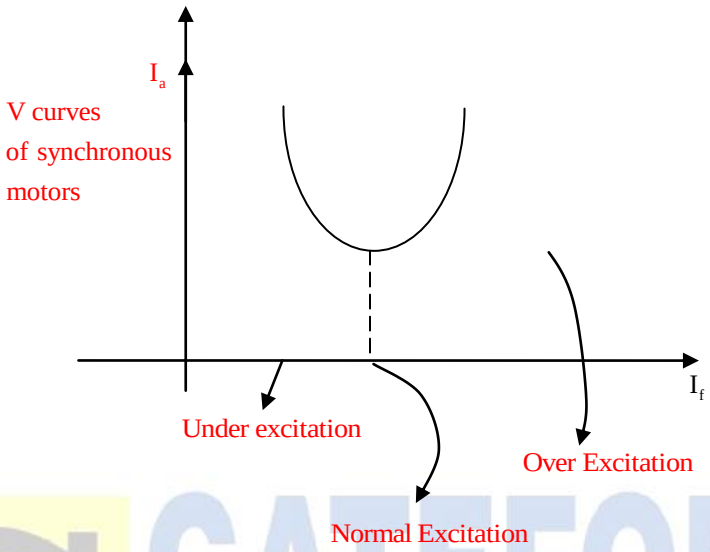
Key: (B)

Exp: Damper bars are required in synchronous generators to produce damping torque when rotor speed is deviated from synchronous speed.

13. In synchronous motor, 'V' curves present the variation of
(A) Armature current with excitation (field)
(B) Armature current with maximum power developed
(C) Field excitation with stalling torque
(D) Field excitation with minimum power developed

Key: (A)

Exp:



14. The synchronous reactance of a 500 V, 50 kVA alternator having an effective resistance of 0.2Ω, if an excitation current of 10A produces 200A armature current on short circuit and an emf of 450 Volts on open circuit is
(A) 2.6Ω (B) 5.2Ω (C) 2.24Ω (D) 4.5Ω

Key: (C)

Exp: Synchronous Impedance, $Z_s = \frac{V_{oc}}{I_{sc}} = \frac{450}{200} = 2.25\,\Omega$

Synchronous Reactance, $X_s = \sqrt{Z_S^2 - R_a^2}$

$$X_s = \sqrt{(2.25)^2 - (0.2)^2}$$

$$X_s = 2.24\Omega$$

15. The main advantage of distributing the winding in slots is to
(A) Reduce the size of the machine
(B) Add mechanical strength to the winding
(C) Reduce the amount of copper required
(D) Reduce the harmonics in the generated emf

Key: (D)

16. When the rotor speed, in a synchronous machine, becomes more than the synchronous speed during hunting, the damper bars develop
(A) Induction motor torque
(B) Induction generator torque

(C) Synchronous motor torque
(D) DC motor torque

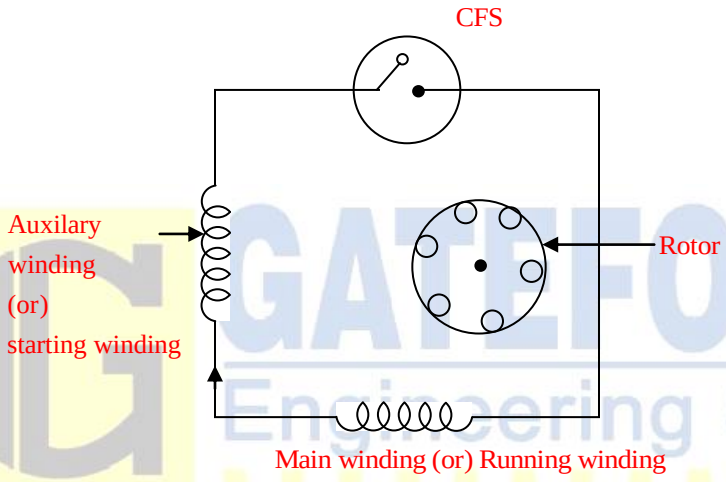
Key: (B)

Exp: If Rotor speed is more than synchronous speed, then induction generator torque will be developed in the opposite direction to rotor rotation due to which rotor will de-accelerate and finally reach to synchronous speed.

17. In a split phase motor, the running winding should have
(A) High resistance and low inductance
(B) High resistance as well as high inductance
(C) Low resistance and high inductance
(D) Low resistance as well as low inductance

Key: (A)

Exp:



In split phase motor, starting torque can be produce when motor windings has unequal $\frac{X}{R}$ ratio.

In order to get unequal $\left(\frac{X}{R}\right)$ ratios following conditions should be statisfied.

1. By designing running winding with thick wire and starting winding with thin wire
2. By placing running winding away from airgap

From above two conditions, we calculated that -
Running winding of motor should have low resistance and high inductance.

18. A 3–phase induction motor draws 50 kW from a 220 V, 50 Hz mains. The rotor emf makes 100 oscillations/minute. If the stator losses are 2 kW the rotor copper loss would be
(A) 0.16 kW (B) 0.32 kW (C) 1.6 kW (D) 3.2 kW

Key: (C)

Exp: Rotor frequency, $f_r = \frac{100}{60} = 1.66$

$\text{Slip} = \frac{f_r}{f} = \frac{1.66}{50} = 0.0333$

Stator output = Rotor input = $50 - 2 = 48$ kW

Rotor Cu losses = S × Rotor input

$= 0.0333 \times 48$

$= 1.6$ kW

19. Starting torque can be obtained in the case of a single phase induction motor with identical main and auxiliary windings by connecting

(A) A capacitor across the mains

(B) A capacitor in series with the machine

(C) A capacitor in series with the auxiliary winding

(D) The main and the auxiliary winding in series

Key: (C)

Exp: Auxilary winding is required in single phase induction motor at the time of starting only to produce starting torque.

So a capacitor is connected in series with the auxiliary winding to increase starting torque.

20. The ratio of starting to full load current for a 10 kW, 400 V, 3–phase induction motor with star delta starter, given the full load efficiency as 0.86, the full load pf is 0.8 and short circuit current is 30 A at 100 V is

(A) 1.9 (B) 1.8 (C) 2.4 (D) 3.2

Key: (A)

Exp: Starting current, $I_{st} = 30$ A

Output power = input power × efficiency

$= 10 \times 0.86 = 8.6$ kW

$$\text{Full load current, } I_{fl} = \frac{8.6 \times 10^3}{\sqrt{3} \times 400 \times 0.8} = 15.5\text{A}$$

$$\frac{I_{st}}{I_{fl}} = \frac{30}{15.5} = 1.935$$

21. The thermal and electrical efficiencies of a 100 MW steam station are respectively 30% and 92%. The coal used has a calorific value of 6400 kcal/kg. For the supply of full–load rated capacity the coal consumption in kg/hour would be approximately

(A) 24340 (B) 32450 (C) 48690 (D) 64910

Key: (C)

Exp: $\eta_{overall} = \eta_{Thermal} \times \eta_{elecrical} = 0.3 \times 0.92 = 0.276$

Units generated/hour = $(100 \times 10^3) \times 1$ = kWh

$$\text{Heat produced/hour, } H = \frac{\text{units generated}}{\eta_{overall}}$$

$$= \frac{10^5 \times 8760}{0.276} = 311.6 \times 10^6 \text{ k cal}$$

$$[\because 1\text{ kWh} = 860\text{ k cal}]$$

$$\text{Coal consumption/hour} = \frac{H}{\text{calorific value}} = \frac{311.6\times10^6}{6400}$$
$$= 48687 \text{ kg}$$

22. Compared to turbines in conventional coal–fired thermal stations, nuclear power plant turbines use steam at
(A) Lower pressure and temperature
(B) Higher pressure and temperature
(C) Lower pressure and higher temperature
(D) Higher pressure and lower temperature

Key: (A)

Exp: Compared to turbines in conventional coal-fired thermal stations, nuclear power plant turbines use steam at low pressure and temperature.

23. A generating station has 500 MW maximum demand and annual load factor of 50%, capacity factor of 40%. The reserve capacity of the plant is
(A) 125 MW (B) 625 MW (C) 500 MW (D) 725 MW

Key: (A)

Exp:
$$\text{Load factor} = \frac{\text{Avg. load}}{\text{Max. demand}}$$
$$\text{O.S} = \frac{\text{Avg. load}}{500}$$
$$\text{Avg load} = 250 \text{ MW}$$
$$\text{Plant capacity factor} = \frac{\text{Avg. load}}{\text{Plant capacity}}$$
$$0.4 = \frac{250}{\text{Plant capacity}}$$
$$\therefore \text{Plant capacity} = 625 \text{ MW}$$
$$\text{Reserve capacity} = \text{Plant capacity} - \text{Max. demand}$$
$$= 625\text{-}500 = 125 \text{ MW}$$

24. The power transmission capability of bipolar lines is approximately
(A) Half that of 3–phase single circuit line
(B) Same as that of 3–phase single circuit line
(C) Twice that of 3–phase single circuit line
(D) Thrice that of 3–phase single circuit line

Key: (B)

Exp: The power transmission capability of bipolar lines is nearly same as that of 3-ϕ single circuit line.

25. The term 'Surge Tank' is associated with which type of power plant?
(A) High head hydro (B) Low head hydro
(C) Medium head hydro (D) Thermal
Key: (A)
Exp: Surge tank is associated with the high head hydro power plant.

26. Equal area criteria in power systems is used in the context of
(A) Deciding maximum loading for a given excitation
(B) Stability of a machine connected to infinite bus bar
(C) Stability of power systems in which many machines are connected to infinite bus bar
(D) Load distribution between a single machine and load drawn from infinite bus bar
Key: (B)
Exp: Equal area criteria in power systems are used in the context of stability of a machine connected to infinite bus bar.

27. In the core–type two–winding transformer, the low–voltage winding is placed adjacent to the steel core, in order to
(A) Facilitate dissipation of heat during the operation of the transformer
(B) Minimize the amount of insulation required
(C) Reduce the chances of axial displacement with respect to the high–voltage winding placed outside
(D) Reduce the mutual radial stress between the two windings
Key: (B)

28. Transient state stability is generally improved by
(A) Using high speed governors on machines
(B) Using low inertia machines
(C) Dispensing with neutral grounding
(D) Any of the above
Key: (A)
Exp: Transient stability is improved by using high speed governors on machines.

29. In a power system, which of the following is/are critical clearance, time of a fault related to ?
1. Transient reactance
2. Sub–transient reactance
3. Reactive power limit
4. Transient stability limit
(A) 1 and 2 (B) 2 only (C) 3 and 4 (D) 4 only
Key: (D)
Exp: In power systems, critical clearance of a fault is related to transient stability limit.

30. A relay is connected to a 400/5 A current transformer and set for 150%. The primary fault current of 2400 A needs a plug setting multiplier of

(A) 2 (B) 4 (C) 6 (D) 8

Key: (B)

Exp: Pick-up value = Rated secondary CT current × current setting

$= 5 \times 1.5 = 7.5A$

$$\text{Fault current in relay coil} = 2400 \times \frac{5}{400} = 30A$$

$$P.S.M = \frac{\text{Fault current in relay coil}}{\text{Pick} - \text{up current}} = \frac{30}{7.5} = 4$$

31. An over–current relay is said to over reach when it operates at a current

(A) Higher than its setting (B) Equal to its setting

(C) Lower than its setting (D) 2/3rd of its setting

Key: (C)

Exp: An over current relay is said to over reach when it operates at a current lower than its setting.

32. The use of high speed circuit breakers

(A) Reduces the short circuit current

(B) Improves the system stability

(C) Decreases the system stability

(D) Increases short circuit current

Key: (B)

Exp: High speed circuit breakers improve the system stability.

33. Consider the following statements :

The intrinsic carrier concentration of a semiconductor

1. Depends on doping
2. Increases exponentially with decrease of band gap of the semiconductor
3. Increases non–linearly with increase of temperature
4. Increases linearly with increase of temperature

Which of the above statements are correct ?

(A) 1, 2 and 3 (B) 1 and 2 only

(C) 2 and 3 only (D) 2 and 4 only

Key: (C)

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

(A) Directly proportional to doping concentration

(B) Directly proportional to intrinsic concentration

(C) Inversely proportional to doping concentration

(D) Inversely proportional to intrinsic concentration

Key: (C)

35. The CE short circuit current gain, β of a transistor

(A) is a monotonically increasing function of the collector current, I_C

(B) is a monotonically decreasing function of I_C

(C) for low values of I_C, it increases and reaches a maximum and then decreases with further increase in I_C

(D) is not a function of I_C

Key: (C)

36. For forward biased diode

(A) Transition capacitance is larger than diffusion capacitance

(B) Diffusion capacitance is larger than transition capacitance

(C) Both capacitances are having same value

(D) Cannot predict with certainty

Key: (B)

37. Consider the following steps in the fabrication of a monolithic bipolar junction transistor:

1. Emitter diffusion
2. Base diffusion
3. Buried layer formation
4. Epi–layer formation

What is the correct sequence of these steps?

(A) 1, 2, 3 and 4 (B) 4, 2, 3 and 1

(C) 1, 3, 2 and 4 (D) 4, 3, 2 and 1

Key: (D)

38. In a p–n junction diode under reverse bias, the magnitude of electric field is maximum at

(A) The edge of the depletion region on the p side

(B) The edge of the depletion region on the n side

(C) The p–n junction

(D) The centre of the depletion region on the n side

Key: (C)

39. Consider the following statements regarding a differential amplifier using an FET pair. The differential output offset voltage is due to:

1. Mismatch between FET parameters
2. Difference between the values of resistors used in the circuit even though they are marked nominally equal
3. Variation in the operating voltage of the circuit

Which of the above statements are correct ?

(A) 1, 2 and 3 (B) 2 and 3 only (C) 1 and 3 only (D) 1 and 2 only

Key: (D)

40. As compared to an LED, an LCD has the distinct advantage of
(A) Extremely low power consumption
(B) Providing a silver display
(C) Being extremely thin
(D) Giving two types of displays

Key: (A)

41. When a transistor is connected in common emitter mode it will have
(A) Negligible input resistance and high output resistance
(B) High input resistance and low output resistance
(C) Medium input resistance and high output resistance
(D) Low input resistance as well as output resistance

Key: (C)

42. The bandwidth of an RC–coupled amplifier is limited by
(A) Coupling capacitors at the low frequency end and bypass capacitors at the high frequency end
(B) Coupling capacitors at the high frequency end and bypass capacitors at the low frequency end
(C) Bypass and coupling capacitors at the low frequency end and device shunt capacitors at the high frequency end
(D) Device shunt capacitors at the low frequency end and bypass as well as coupling capacitors at the high frequency end

Key: (C)

43. Which one of the following systems gives the highest figure–of–merit (a measure of the noise performance)?
(A) WBFM (B) NBFM (C) AM (D) SSB

Key: (A)

44. The increase in value of β of transistor can cause the fixed bias circuit to
(A) Shift from saturation region to active region
(B) Shift the operation from active mode to saturation mode
(C) Shift the operation from saturation mode to cutoff mode
(D) Shift the operation from cutoff mode to active mode

Key: (B)

45. The gain and distortion of an amplifier are respectively 150 and 5%. When used with a 10% negative feedback the % distortion would be
(A) 5/16 (B) 9/16 (C) 6 (D) 8

Key: (A)

Exp: Distortion 'D' with feedback $= \dfrac{\text{Distortion without feedback}}{(1+A_0\beta)}$

where A_0 is Gain without feedback

β is feedback factor

$$D = \frac{5\%}{1+(150\times 0.1)} = \frac{5}{16}\%$$

46. A two stage amplifier with negative feedback
(A) can become unstable for larger values of β
(B) becomes unstable at high and very low frequencies if A is very large
(C) becomes unstable when the pole frequencies become complex
(D) is always stable

Key: (D)

47. In case of amplifiers, which coupling gives the highest gain ?
(A) Transformer coupling
(B) Resistance coupling
(C) Impedance coupling
(D) Capacitance coupling

Key: (A)

48. Active load is primarily used in the collector of the differential amplifier of an OPAMP
(A) To increase the output resistance
(B) To increase the differential gain A
(C) To handle large signals
(D) To provide symmetry

Key: (B)

49. The pulse width out of a one shot multi vibrator increases when the
(A) Supply voltage increases
(B) Timing resistor decreases
(C) UTP decreases
(D) Timing capacitance increases

Key: (D)

Exp: Pulse width is given by

$\tau = 1.1RC$

50. In a dc machine, for the same number of slots and same current in the armature conductor, which one of the following will induce higher emf ?
(A) Lap winding
(B) Wave winding
(C) Compensating winding
(D) Pole winding

Key: (D)

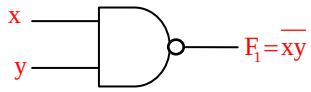
Exp: Wave connected armature winding is used in high voltage and low current applications since it has more number of turns in each parallel path when compared to lap connected armature winding.

51. If the output of a logic gate is '1' when all its inputs are at logic '0', the gate is either
(A) a NAND or a NOR (B) an AND or an EX–NOR
(C) an OR or a NAND (D) an EX–OR or an EX–NOR

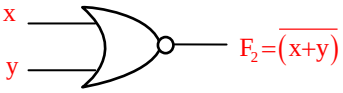
Key: (A)

Exp:

If $x=y=0$
$F_1=1$



If $x=y=0$
$F_2=1$



52. Consider the following expressions :
1. $Y=f(A,B,C,D)=\Sigma(1,2,4,7,8,11,13,14)$
2. $Y=f(A,B,C,D)=\Sigma(3,5,7,10,11,12,13,14)$
3. $Y=f(A,B,C,D)=\Pi(0,3,5,6,9,10,12,15)$
4. $Y=f(A,B,C,D)=\Pi(0,1,2,4,6,8,9,15)$

Which of these expressions are equivalents of the expression $Y=A\oplus B\oplus C\oplus D$?
(A) 1 and 2 (B) 1 and 4 (C) 2 and 3 (D) 1 and 3

Key: (D)

Exp: $Y=A\oplus B\oplus C\oplus D$

XOR is always an odd function

$Y=\bar{A}\bar{B}\bar{C}D+\bar{A}\bar{B}C\bar{D}+\bar{A}B\bar{C}\bar{D}+A\bar{B}\bar{C}\bar{D}+\bar{A}BCD+A\bar{B}CD+AB\bar{C}D+ABC\bar{D}$

$Y=\Sigma m(1,2,4,7,8,11,13,14)$

$Y=\Pi m(0,3,5,6,9,10,12,15)$

53. Multiplexing scheme which uses carrier phase shifting and synchronous detection to permit two DSB signals to occupy the same frequency band is called
(A) NBFM (B) CDMA (C) QAM (D) FDMA

Key: (C)

Exp: Quadrature-carrier multiplexing, also known as quadrature amplitude modulation (QAM), utilizes carrier phase shifting and synchronous detection to permit two DSB signals to occupy the same frequency band.

54. In a 5 × 7 dot matrix format
(A) 64 bits are required to store 64 alphanumeric characters
(B) 560 bits are required to store 64 alphanumeric characters
(C) 1120 bits are required to store 64 alphanumeric characters
(D) 2240 bits are required to store 64 alphanumeric characters

Key: (D)

Exp: The OFF lamps correspond to logic 0 outputs from an ROM with a $5\times7=35$ bit output word, while the ON lamps correspond to logic 1. To store 64 alphanumeric characters and other symbols, one ROM requires $64\times7\times5=2,240$ bits of storage.

55. Ready pin of microprocessor is used
(A) To indicate that microprocessor is ready to receive inputs
(B) To indicate that microprocessor is ready to receive outputs
(C) To introduce wait state
(D) To provide direct memory access

Key: (C)

Exp: Wait states can be introduced in any machine cycle except bus idle cycle between T_2 and T_3.

Wait states are introduced in the machine cycle if READY pin is tied low at the second T-state of a machine cycle.

56. A bus connected between the CPU and the main memory that permits transfer of information between main memory and the CPU is known as
(A) DMA bus (B) Memory bus
(C) Address bus (D) Control bus

Key: (B)

Exp: DMA is a feature of computers that allows certain hardware subsystems within the computer to access system memory independently of the 'CPU'. It is used for "memory to memory" copying or moving of data within memory.

Memory bus is the set of "wires" that is used to carry memory addresses and data to and from the system RAM. The memory loss is made up of two parts:

(i) Data bus, and (ii) Address bus

When we just make reference to the memory bus they are usually referring to the data bus, which carries actual memory data within the PC whereas the address bus is used to select the memory address that the data will come from or go to on a read or write.

Control bus is a computer bus used by CPUs for communicating with other devices within the computer.

From the above information best possible answer is option (B) i.e., memory bus.

57. A microprocessor is designed to access 2 k ROM, 4 k PROM and 64 k RAM. The number of address lines required to access these memories by the μP is
(A) 16 (B) 17 (C) 18 (D) 19

Key: (A)

Exp: Max memory is 64 k RAM

$2^6\times2^{10}=2^{16}$

No. of address lines = 16

58. Consider the following statements:
1. SRAM is made up of flip flops
2. SRAM stores bit as voltage
3. DRAM has high speed and low density
4. DRAM is cheaper than SRAM

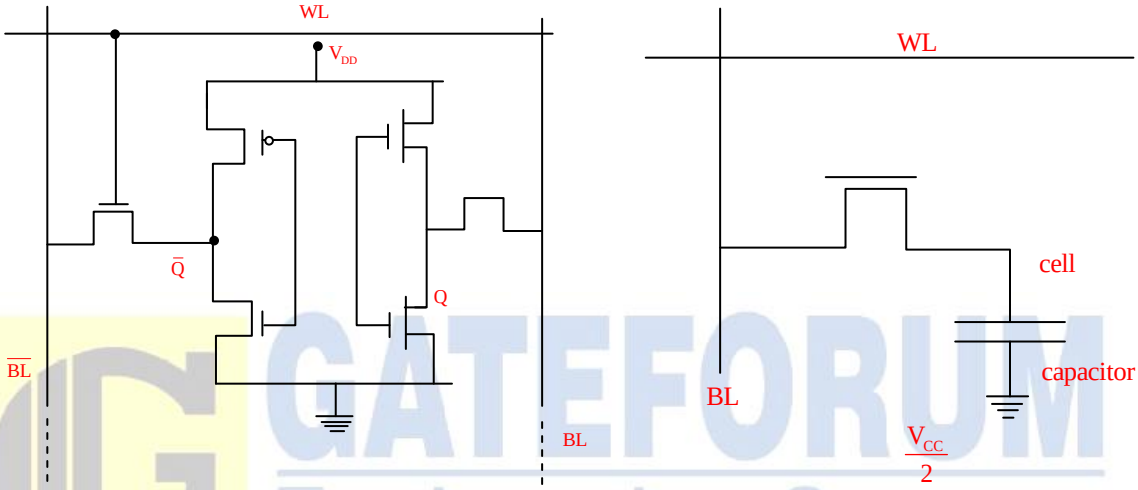
Which of the above statements are correct ?

(A) 1, 2 and 3 (B) 1, 3 and 4
(C) 2, 3 and 4 (D) 1, 2 and 4

Key: (D)

Exp:

SRAM Cell **DRAM Cell**



59. In order to generate continuous square wave using 8254 timer, it must be programmed in
(A) mode 0 (B) mode 1 (C) mode 2 (D) mode 3

Key: (D)

Exp: To generate continuous square wave using 8254 times, it must be programmed in mode 3.

60. The operations executed by two or more control units are referred as
(A) Micro-operations (B) Macro-operations
(C) Multi-operations (D) Bi control–operations

Key: (B)

Exp: The operations executed by two or more control units are referred as macro operations.

61. With reference to 8085 microprocessor, which of the following statements are correct ?
1. INR is 1-byte instruction
2. OUT is 2-byte instruction
3. STA is 3-byte instruction

(A) l and 2 only (B) 2 and 3 only (C) l and 3 only (D) 1, 2 and 3

Key: (D)

Exp: INR is 1-byte instruction
OUT is 2-byte instruction
STA is 3-byte instruction

62. Consider the following registers:
1. Accumulator and flag register
2. B and C registers
3. D and E registers
4. H and L registers

Which of these 8-bit registers of 8085 μP can be paired together to make a 16-bit register ?

(A) 1, 3 and 4 (B) 2, 3 and 4 (C) 1, 2 and 3 (D) 1, 2 and 4

Key: (B)

Exp: BC, DE, HL registers can be paired to make a 16 bit register.

63. The first microprocessor to include virtual memory in the Intel microprocessor family is

(A) 80286 (B) 80386 (C) 80486 (D) Pentium

Key: (A)

Exp: 80286 is first microprocessor to include virtual memory in the Intel microprocessor family.

64. In 8085 microprocessor, which mode of addressing does the instruction CMP M use ?

(A) Direct addressing (B) Register addressing

(C) Indirect addressing (D) Immediate addressing

Key: (C)

Exp: CMPM, compare memory instruction uses indirect addressing mode.

65. Which of the following 8085 instruction will require maximum T-states for execution?

(A) XRI byte (B) STA address (C) CALL address (D) JMP address

Key: (C)

Exp:

	No. of T– states
XRI byte	7
STA	13
CALL	18
JMP	10

66. How many machine cycles are required by STA instruction ?

(A) 2 (B) 3 (C) 4 (D) 5

Key: (C)

Exp: STA instruction requires 4 machine cycles:
Opcode fetch, Memory read, Memory read, Memory write

67. Which of the following instructions is closest match to the instruction POP PC ?

(A) RET (B) PCHL (C) POP PSW (D) DAD SP

Key: (A)

Exp: POP instruction and RET instruction both increment stack point by 2.

68. LOADER is a program that

(A) Loads the mnemonics and generates a hex file

(B) Loads the hex file and converts to the executable file

(C) Loads the COM file and generates the binary code

(D) Loads English like command and generates the binary code

Key: (B)

Exp: LOADER is a program that loads the hex file and converts the executable file.

69. Direct-Memory Access channel (DMA) facilitates data to move in and out of the system

(A) On first-come first-serve basis

(B) With equal time delay

(C) Without a sub-routine

(D) Without programme intervention

Key: (D)

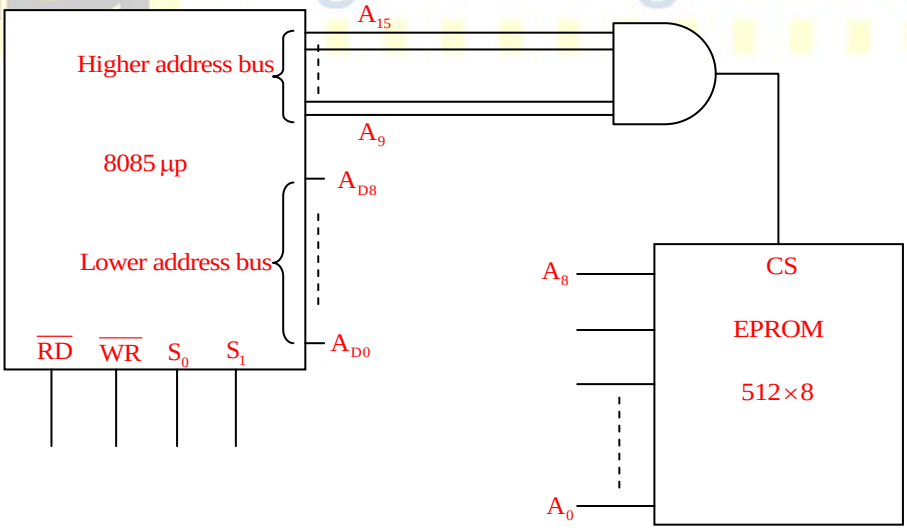
Exp: DMA facilitates data to move in and out to the system without programme intervention.

70. The address lines A_{15} to A_9 of a microprocessor with 64K memory capacity are connected to the chip select line of a 512 × 8 EPROM through an AND gate. Its memory map ranges from 0000 to

(A) 00FF (B) 03FF (C) 02FF (D) 01FF

Key: (D)

Exp:



In question they did not give which EPROM chip selection uses Active low/high logic.

1. If we assume Active Low Logic

Output of AND gate must be '0' only when all input's of AND gate are zero (i.e. A_{15}-----A_9 = all 0's)

Chip selection lines							EPROM memory address lines								
A_{15}	A_{14}	A_{13}	A_{12}	A_{11}	A_{10}	A_9	A_8	A_7	A_6	A_5	A_4	A_3	A_2	A_1	A_0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
⋮							⋮								
0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1
0				1			F				F				

So, memory rang is from $(0000-01FF)H$

2. If we assume Active High Logic

Output of AND gate must be '1' only when all input's of AND gate are '1' – (i.e., A_{15}----A_9 = all 1's)

So memory range is from $(0000-FFFF)H$

71. A device or a peripheral equipment which is not in direct communication with CPU of a computer is called

(A) Off line device (B) On line device

(C) Active device (D) Slow device

Key: (A)

Exp: An offline device is not in direct communication with CPU.

72. Three devices A, B, and C have to be connected to an 8085 microprocessor. Device A has highest priority and device C has the lowest priority. In this context, which of the following is correct assignment of interrupt inputs ?

(A) A uses TRAP, B uses RST 5.5 and C uses RST 6.5

(B) A uses RST 7.5, B uses RST 6.5 and C uses RST 5.5

(C) A uses RST 5.5, B uses RST 6.5 and C uses RST 7.5

(D) A uses RST 5.5, B uses RST 6.5 and C uses TRAP

Key: (B)

Exp: RST 7.5 highest priority

RST 6.5 second highest priority

RST 5.5 lowest priority

73. Which of the following data transfers is not possible in microprocessor ?

(A) Memory to accumulator

(B) Accumulator to memory

(C) Memory to memory

(D) I/O device to accumulator

Key: (C)

Exp: Memory to memory data transfer is not possible in microprocessor.

74. If the memory chip size is 1024 × 4, the number of memory chips required to design 8 k memory is

(A) 8 (B) 256 (C) 16 (D) 32

Key: (C)

Exp: No. of memory chips $= \dfrac{(8\times 1024)\times 8}{1024\times 4} = 16$

75. A 100V carrier peak changes from 160 V to 40 V by a modulating signal. The modulation factor is

(A) 0.3 (B) 0.5 (C) 0.6 (D) 0.7

Key: (C)

Exp: Given $A_c = 100$

and $A_c(1+\mu) = 160$

$A_c(1-\mu) = 40$

So, $1+\mu = 1.6$

$\boxed{\mu = 0.6}$

76. Which one of the following statements is ***not*** correct ?

(A) FM has infinite number of side bands

(B) Modulation index for FM is always greater than one

(C) As modulation depth increases the BW increases

(D) As modulation depth increases the sideband power increases

Key: (D)

Exp: In case of FM when modulation depth increases, side band power decreases.

77. A broadcast AM transmitter radiates 50 kW of carrier power. The radiation power at 85% of modulation is

(A) 68.1 kW (B) 60.8 kW (C) 61.8 kW (D) 62.0 kW

Key: (A)

Exp: P_T (Total power (or) radiation power) $= P_c\left[1+\dfrac{m^2}{2}\right]$

Here m=0.85

$P_t = 50k\left[1+\dfrac{(0.85)^2}{2}\right]$

$= 68.06$ kW

78. Modulation has a number of advantages. Which one of the following is ***not*** correct ?

(A) Efficient transmission

(B) Reduction in noise and interference

(C) Overcomes hardware limitations

(D) Requires higher power transmitter

Key: (C)

79. In phase modulation, the frequency deviation is
(A) Independent of the modulating signal frequency
(B) Increasingly proportional to the modulating signal frequency
(C) Directly proportional to the modulating signal frequency
(D) Inversely proportional to the square root of the modulating signal frequency

Key: (C)

Exp: PM Equation in time domain is

$$f(t) = A_C \cos\left(\omega_c t + k_p A_m \sin \omega_m t\right)$$

$$\theta(t) = \omega_c t + k_p A_m \sin \omega_m t$$

$$f_i(t) = \frac{1}{2\pi}\frac{d\theta(t)}{dt} = f_c + k_p A_m f_m \sin \omega_m t$$

$$f_i(max) = f_c + k_p A_m f_m$$

In phase modulation frequency deviation is $K_p A_m f_m$, which is proportional to the message signal frequency.

80. A Pre-emphasis circuit provides extra noise immunity by
(A) Boosting the base frequencies
(B) Amplifying the higher audio frequencies
(C) Pre-amplifying the whole audio band
(D) Converting the phase modulation to FM

Key: (B)

Exp: Pre-emphasis is a way to boost only the signal's high-frequency components while leaving the low frequency components in their original state, to improve the SNR at high frequencies.

81. Which of the following are the advantages of FM over AM ?
1. Better noise immunity is provided
2. Lower bandwidth is required
3. Transmitted power is more useful
4. Less modulating power is required

(A) 1, 2 and 3 (B) 1, 2 and 4 (C) 2, 3 and 4 (D) 1, 3 and 4

Key: (D)

Exp: In case of FM more bandwidth is required for transmission, which is the disadvantage in FM.

82. Consider the following statements comparing delta modulation (DM) with PCM system:
DM requires
1. A lower sampling rate
2. A higher sampling rate
3. A higher bandwidth
4. Simple hardware

Which one of the above statements are correct ?

(A) 1 and 3 only (B) 2 and 4 only (C) 1, 3 and 4 (D) 2, 3 and 4

Key: (B)

Exp: DM requires less band width and simple hardware compared to PCM System.

83. In a radio receiver, AGC works by
(A) Tuning the local oscillator
(B) Turning off the audio section in the absence of a received signal
(C) Adjusting the gain of RF and IF
(D) Limiting the signal level using a clipper in the audio section

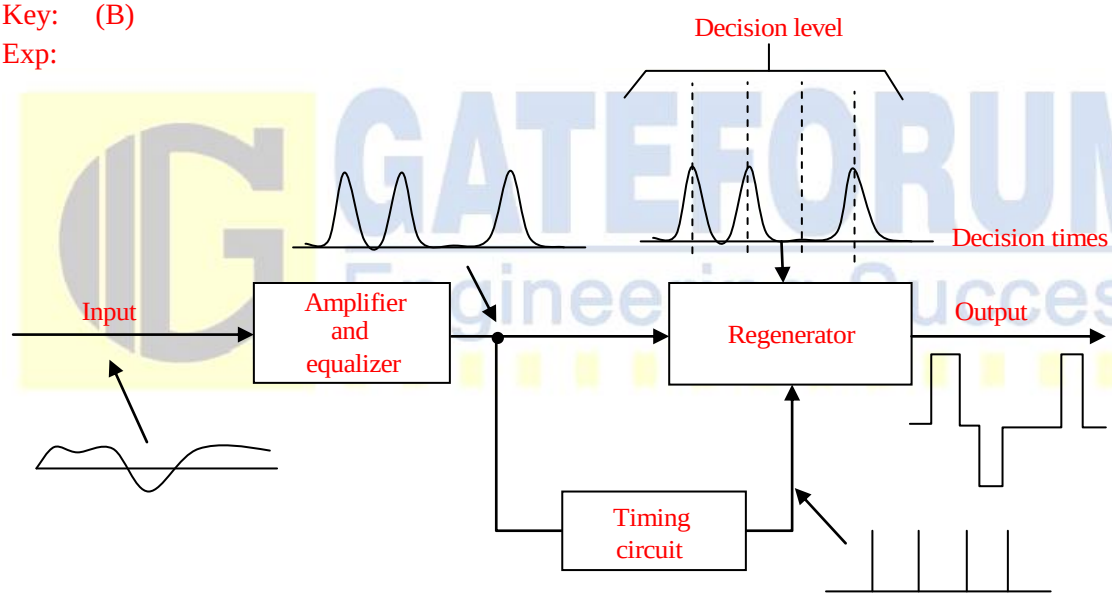
Key: (C)

Exp: Automatic Gain Control or AGC is a circuit design which maintains the same level of amplification for sound or radio frequency. If the signal is too low the AGC circuit will increase (amplify) the level and if signal is too high the AGC circuit will lower it to maintain a constant level as possible, in IF and RF amplifiers.

84. The correct sequence of operations which a regenerative repeater performs is
(A) Timing information extraction, equalization and decision making
(B) Equalization, timing information extraction and decision making
(C) Timing information extraction, decision making and equalization
(D) Equalization, decision making and timing information extraction

Key: (B)

Exp:



Regenerate Repeator Block Diagram Used In PCM

85. In a typical AM receiver circuit, the oscillator frequency is
(A) Same as signal frequency
(B) Always equal to 455 Hz
(C) Lower than the signal frequency by 455 kHz
(D) Higher than the signal frequency by 455 kHz

Key: (D)

Exp: In AM receiver, f_ℓ = local oscillator frequency

f_s = signal frequency

$f_\ell > f_s$, which is $f_\ell - f_s = 455\,kHz$

86. A TDM link has 20 signal channels and each channel is sampled at 8 kHz. Each sample is represented by 7 bits and contains an additional bit for synchronization. The total bit rate for the TDM link is

(A) 1128 kbps (B) 1180 kbps (C) 1280 kpbs (D) 128 Mbps

Key: (A)

Exp: Bit rate for TDM $= (nN+1)f_s$

$= (20\times 7+1)f_s$

$= 1128$ kps

87. A scheme in which several channels are interleaved and then transmitted together is known as

(A) Frequency division multiplexing

(B) Time division multiplexing

(C) A group

(D) A super group

Key: (B)

88. The secondary TDM level provides

(A) 24-channels in μ –law systems and 30 channels for a-law systems

(B) 48-channels in μ –law systems and 96 channels for a-law systems

(C) 96-channels in μ –law systems and 120 channels for a-law systems

(D) 128-channels in μ –law systems and 200 channels for a-law systems

Key: (C)

89. In a Frequency Division Multiplexed (FDM) system, cross talk occurs due to

(A) Imperfect time synchronization between transmitter and receiver

(B) Imperfect filtering at the receiver front-end

(C) Imperfect carrier recovery at the receiver

(D) Channel noise

Key: (B)

Exp: In FDM the crosstalk may occur when frequency response of filter is not sharp enough. To eliminate or to reduce crosstalk a guardband is provided between the adjacent channels.
In TDM crosstalk may occur due to insufficient transmission bandwidth to preserve the shape of the TDM pulses.

90. Which one of the following power semi-conductor device has bi-directional current capability?

(A) SCR (B) MOSFET (C) IGBT (D) TRIAC

Key: (D)

Exp: TRIAC can conduct current in either direction when it is triggered (turn-on). Basically it is an anti-parallel connection of two unidirectional SCRs.

91. Consider the following statements :
SCR can be turned on by
1. Applying anode voltage at a sufficiently fast rate
2. Applying sufficiently large anode voltage
3. Increasing the temperature of SCR to sufficiently large value
4. Applying sufficiently large gate current

Which of the above statements are correct ?
(A) 1, 2 and 3 (B) 1, 3 and 4 (C) 1, 2 and 4 (D) 2, 3 and 4

Key: (C)

Exp: SCR can be turned on by applying sufficient dv/dt, forward voltage and gate current. When SCR is triggered by increasing temperature of SCR, then device may get fail

92. Turn on time of an SCR can be reduced by using a
(A) Rectangular pulse of high amplitude and narrow width
(B) Rectangular pulse of low amplitude and wide width
(C) Triangular pulse
(D) Trapezoidal pulse

Key: (A)

Exp: Larger values of gate current during turn-on interval will increase the size of turned-on area by providing a large amount of excess carriers. Hence high amplitude of gate current must be applied to reduce turn-on interval of device.

93. Which of the following is the fastest switching device ?
(A) JFET (B) BJT (C) MOSFET (D) Triode

Key: (C)

Exp: MOSFETs are used in high frequency applications because of their inherent high speed turn-on and turn-off capabilities.

94. Which of the following does not cause damage of an SCR ?
(A) High current
(B) High rate of rise of current
(C) High temperature
(D) High rate of rise of voltage

Key: (D)

Exp: SCR can damage when it is subjected to large anode current, high di/dt and high temperature but it cannot damage when it is subjected to high rate of rise of voltage.

95. For the V-I characteristics of an SCR, which of the following statements are correct ?
1. It will trigger when the applied voltage is more than the forward break over voltage
2. Holding current is greater than latching current
3. When reverse biased, a small value of leakage current will flow
4. It can be triggered without gate current

(A) 1, 2 and 3 (B) 1, 3 and 4 (C) 1, 2 and 4 (D) 2, 3 and 4

Key: (B)

96. Which of the following transistors is symmetrical in the sense that emitter and collector or source and drain terminals can be interchanged ?

(A) JFET (B) MOSFET (C) NPN transistor (D) PNP transistor

Key: (B)

Exp: In MOSFET, when source and drain terminals are interchanged there is no change in input and output relationships.

97. The snubber circuit used to shape the turn-on switching trajectory of thyristor and/or to limit di/dt during turn on is

(A) L - R snubber polarized (B) R - C snubber polarized

(C) R - C snubber unpolarized (D) L - R snubber unpolarized

Key: (A)

Exp: Polarized L-R snubbers are used to shape the turn-on switching trajectory of switches and/or to limit di/dt during turn-on.

98. In a forward converter, a tertiary winding is used. What is the reason ?

(A) To provide $\frac{di}{dt}$ protection to the switching device

(B) To provide $\frac{dv}{dt}$ protection to the switching device

(C) To provide electrical isolation between the input and output

(D) To demagnetize the core before the application of the next switching pulse

Key: (D)

Exp: In forward converter transformer, magnetizing current must be reset to zero at the end of each cycle. Otherwise stored energy in the transformer core would result in converter failure.
A tertiary winding or demagnetizing winding is added to the transformer so that magnetizing current can return to the input source V_S when transistor turns off.

99. Consider the following statements:
Phase controlled converters at small values of output voltage have

1. Large harmonics in utility system
2. Poor power factor
3. High efficiency
4. Notches in line voltage waveform

Which of the above statements are correct ?

(A) 1 and 2 only (B) 1, 2 and 4 (C) 2, 3 and 4 (D) 1 and 4 only

Key: (B)

Exp: Phase controlled converters inject large harmonics into the utility system. At small values of output voltage, these operate at a very poor power factor as well as a poor displacement factor. Additionally these converters produce notches in the line voltage waveform.

100. Which of the following regulator provides output voltage polarity reversal without a transformer ?
(A) Buck regulator (B) Boost regulator
(C) Buck-Boost regulator (D) CUK regulator
Key: (C)

101. In a $3-\phi$ controller bridge rectifier, the maximum conduction of each Thyristor is
(A) 60° (B) 90° (C) 120° (D) 150°
Key: (C)
Exp: In $3-\phi$ controlled bridge rectifier each SCR can conduct for 120°.

102. A line commutated phase-controlled inverter is operating at its inverter limit. There can be a commutation failure if
(A) The frequency decreases
(B) The voltage increases
(C) The frequency increases
(D) Both voltage and frequency change such that v/f is constant
Key: (C)
Exp: The extinction time interval $t_\gamma = \gamma/\omega$ should be greater than thyristor turn-off time t_q, otherwise commutation failure will occur.
If frequency increases, t_γ decreases then commutation failure may occur.

103. A single phase, voltage source, square wave inverter feeds a pure inductive load. The wave form of the current will be
(A) Sinusoidal (B) Rectangular (C) Trapezoidal (D) Triangular
Key: (D)
Exp: When a VSI feeds pure inductive load, then the nature of output current waveform is triangular.

104. What should be the frequency modulation ratio (m_f) for a 3-phase inverter if the m_fth harmonic and its odd multiples are to be suppressed in the line-to-line voltages ?
(A) m_f should be odd
(B) m_f should be even
(C) m_f should be an odd multiple of 3
(D) m_f should be even multiple of 3
Key: (C)
Exp: The harmonic at m_f and its odd multiplies are to be suppressed in the line to line voltages if m_f (frequency modulation) is chosen to be an odd multiple of 3.

105. The device used for switching in a switched Mode Power supply is
(A) Diode (B) Thyristor (C) GTO (D) MOSFET
Key: (D)

Exp: MOSFETs are used in high frequency applications like switched mode power supply because it is high frequency switching device.

Directions:

Each of the next **Fifteen (15)** items consists of two statements, one labelled as the 'Statement-(I)' and the other as 'Statement-(II)'. 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

106. Statement (I):

Size of power transformer is inversely proportional to the operation frequency.

Statement (II):

Copper loss is proportional to frequency.

Key: (C)

107. Statement (I):

In a dc shunt generator the 'build-up' induced voltage, at its terminals, is given by the intersection point of the Field Resistance Line (FRL) with the No-Load Characteristics (NLC) of the machine.

Statement (II):

The generator fails to build up any voltage at its terminals, when the slope of the FRL is higher than that of the straight line portion of the NLC.

Key: (A)

108. Statement (I):

The 'Rating' of alternators is determined by their heating and hence, the losses in them.

Statement (II):

Along with the voltage frequency and MVA the operating minimum lagging power-factor has also to be included in the Rating specifications.

Key: (B)

109. Statement (I):

The no load current drawn by the induction motor is usually more than that of a transformer.

Statement (II):

An induction motor can be considered as a generalized transformer.

Key: (B)

110. Statement (I):
The speed control of induction motor by pole changing is suitable for cage motors only.
Statement (II):
The cage rotor automatically develops number of poles equal to the poles of stator winding.

Key: (D)

111. Statement (I):
In high head hydel stations, the action of governor due to sudden change in load, changes the water admitted to turbine blades leading to water hammering effect on penstocks.
Statement (II):
A surge tank in high head hydel stations is used to absorb the flow variations.

Key: (A)

Exp: Both statements are correct and Statement (II) is the correct explanation of Statement (I).

112. Statement (I):
As applied to flip flops, asynchronous inputs are overriding inputs.
Statement (II):
Direct inputs of flips flops are effective even in the absence of the control/clock input.

Key: (A)

Exp: Direct inputs of flip-flops are effective whether control or clock input is present or absent.

113. Statement (I):
ECL circuit has the highest speed of any of the currently available logic circuits.
Statement (II):
It is a fact that transistors never operate fully saturated or cut-off.

Key: (A)

114. Statement (I):
The collection of all state variables (memory element stored values) at any time, contain all the information about the past, necessary to account for the circuit's future behavior.
Statement (II):
A change in the stored values in memory elements changes the sequential circuit from one state to another.

Key: (B)

Exp: Statement (I) is true and Statement (II) is correct explanation to Statement (I).

General state variables are $\frac{di_L}{dt}, \frac{dv_c}{dt}$,

If any change in the stored values (L, C changes), the sequential circuit built by flip flop changes from one state to another.

115. Statement (I):
Segment Override Prefix (SOP) is used when a default offset register is not used with its default base segment register, but with a different base register.
Statement (II):
The offset registers IP and SP can never be associated with any other segment registers apart from their respective default segments.
Key: (B)
Exp: Statement (I) is true and Statement (II) is correct explanation to Statement (I).

116. Statement (I):
Branch instructions in a microprocessor are used to change the sequence of program.
Statement (II):
All logical instructions are branch instructions.
Key: (C)
Exp: The Branch group instructions include calling of subroutines, conditional and unconditional jumps, returns and restarts.
The logic group instructions perform logic operations such as AND, OR, XOR compare data.

117. Statement (I):
PAM, PWM and PPM modulation belong to analog modulation and the PCM modulation belongs to the digital modulation.
Statement (II):
PAM, PWM and PPM modulations are similar to AM, FM and PM modulation.
Key: (B)

118. Statement (I):
High frequency DSB is obtained in practice using two AM modulators arranged in a balanced configuration.
Statement (II):
Perfect square-law devices are difficult to design.
Key: (B)
Exp: Statement (I) and Statement (II) both are correct but they are not related each other.

119. Statement (I):
The 'turn-on' and 'turn-off' time of a MOSFET is very small.
Statement (II):
The MOSFET is a majority-carrier device.
Key: (B)

120. Statement (I):
For the same voltage output, the power factor of a single phase semi converter is better than a full converter
Statement (II):
The single phase semi converter uses two diodes and two controlled switches.
Key: (B)