

PART III

03 – ELECTRICAL AND ELECTRONICS ENGINEERING

(Answer ALL questions)

56. An electrical circuit with 10 branches and 7 junctions will have
- 10 loop equations
 - 4 loop equations
 - 3 loop equations
 - 7 loop equations
57. A 0.5 metre long conductor carrying a current of 2 amperes is placed in a magnetic field having the flux density of 0.05 wb/m^2 . What will be the amount of force experienced by the conductor?
- 1 N
 - 2 N
 - 0.05 N
 - 0.5 N
58. When two waves are 90° out of phase?
- each has its peak value at the same time
 - each has its minimum value at the same time
 - one has its peak value when the other has zero value
 - one has its positive peak when the other has its negative peak
59. Which of the following statements is correct?
- The strength of magnetic flux in a simple magnetic field continuously increases from initial value to final value
 - The strength of magnetic flux in a simple magnetic field continuously decreases from initial value to final value
 - The strength of magnetic flux in simple magnetic field is constant and has same value in every part of the magnetic field
 - None of the above statements is correct
60. If the effective voltage of the sinusoidal voltage is 11 volts. What will be the average value of sinusoidal voltage?
- 5 volts
 - 10 volts
 - 1.1 volts
 - 11 volts
61. The Fourier series expansion of an even periodic function contains
- Sine terms
 - Constant terms
 - Cosine terms
 - Harmonics
62. What will happen if the frequency of power supply in a pure capacitive circuit is doubled?
- The current will be reduced to half
 - The current will also be doubled
 - The current will remain same
 - The current will increase by four fold
63. If RC is the time constant of the R-C circuit, how much time the capacitor will take to get fully charged?
- RC seconds
 - 4 RC seconds
 - 3 RC seconds
 - 5 RC seconds
64. If the number of turns of a coil in a magnetic circuit is doubled then the winding inductance value of the coil is
- doubled
 - the same
 - halved
 - squared

65. Mutual torque of a doubly excited system is a function of
- δ
 - 2δ
 - $\sin \delta$
 - $\sin 2\delta$

where δ is the angle of the rotor position.

66. When a single phase winding is excited with single phase supply (V_s, f_s) then it produces
- a unidirectional rotating magnetic field at angular velocity, ω_s
 - a pulsating magnetic field at frequency, f_s
 - two magnetic fields rotating in opposite direction at angular velocity, ω_s
 - both b and c

67. Induction motor at no-load operates with poor factor because
- it needs more reactive power to magnetise the air-gap
 - its real power consumption is less
 - its magnetising reactance is much larger than equivalent resistance
 - all of the above

68. A slip ring induction motor can develop maximum torque at starting if
- rotor resistance is made zero
 - rotor leakage reactance is made zero
 - rotor resistance is adjusted to a value equal to rotor leakage reactance
 - magnetizing reactance is much higher than equivalent resistance

69. All sequence networks are connected in series for the following fault
- SLG fault
 - LL fault
 - LLG fault
 - 3 Phase fault

70. Fault level means
- fault current
 - fault MVA
 - voltage at the point of fault
 - fault power factor

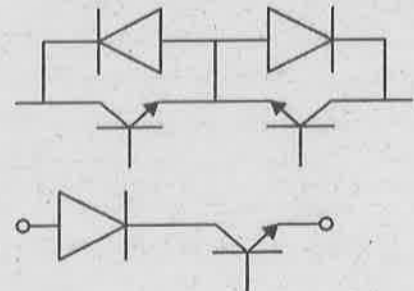
71. Which one of the following relays has the capability to anticipate the possible major fault in a transformer?
- Over current relay
 - Differential relay
 - Buchholz relay
 - Over fluxing relay

72. When a phase shifting transformer's taps are moved in such a direction as to advance the phase position?
- var flows will increase
 - var flows will decrease
 - there will be an increase in power flow in the line
 - voltage will be increased

73. On high voltage line under peak load conditions var compensation is provided by using
- series inductor
 - shunt capacitors
 - shunt inductors
 - any of the above

74. The demand factor for a residential load is about
- 2.1
 - 1.2
 - 0.2
 - 0.7

75. Phase shifting transformer is employed for
- Regulating bus voltage
 - Regulating power flow though the transmission line
 - Regulating reactive power flow
 - Regulating inrush current

76. Commutation overlap angle μ is influenced by
- Harmonics on ac side
 - Source inductance
 - Current margin
 - AC bus strength
77. Weak AC bus is characterized by
- High Short Circuit Capacity
 - High Short Circuit Ratio
 - Low Short Circuit Capacity
 - Low Thevenin equivalent reactance viewed from AC bus
78. The power reversal in HVDC link is achieved by
- Current reversal
 - Voltage reversal
 - VDCOL operation
 - Opening and closing DC breakers
79. The value of damping coefficient at the point, where the root loci of a second order system crosses the imaginary axis with critical gain is
- zero
 - negative
 - unity
 - positive
80. The lag compensation when provided for a second order system, upon proper design
- Increases the bandwidth and the phase margin
 - Increases the bandwidth and decreases the phase margin
 - Decreases the bandwidth and Increases the phase margin
 - Decreases the bandwidth and the phase margin
81. Correction to be applied at the corner frequency for the Bode's asymptotes, when complex conjugate zeros occur with damping factor of 0.1 is,
- +14 dB
 - +6 dB
 - 0 dB
 - 14 dB
82. Consider a system whose transfer function is given by $G(s) = 3/[(s)(s+3)]$. The steady state response of the system for an input $u(t) = 3\sin(3t)$ is given by
- $3/\sqrt{6} \sin(5t - \pi/4)$
 - $1/\sqrt{6} \sin(5t - \pi/4)$
 - $3/\sqrt{6} \sin(15t - 3\pi/4)$
 - $1/\sqrt{6} \sin(15t - 3\pi/4)$
83. A given $G(s)$ polynomial has its roots at -1, -2 and -3 respectively. Location of poles when the axis of s plane is shifted by one unit towards left by replacing s by $s-1$ will be
- 2, -3 and -4
 - 1, -2 and -3
 - 0, -1 and -2
 - 1, 2 and 3
84. The centroid of the root locus for the system with transfer function $G(s) = (s+1)/[(s+3)(s+5)]$, is given by
- 1/15
 - 1/8
 - 7/2
 - 7
85. Identify four quadrant switch from the following:
- Diode connected in series
 - Two diodes connected in series
- 
- Diode connected in series
 - Two diodes connected in series
86. Current crowding in devices is due to
- Voltage applied
 - Low dv/dt
 - Excessive di/dt
 - High dv/dt

87. Maximum allowable temperature at the junction of devices will be -

- 50°C
- 75°C
- 15°C
- 200°C

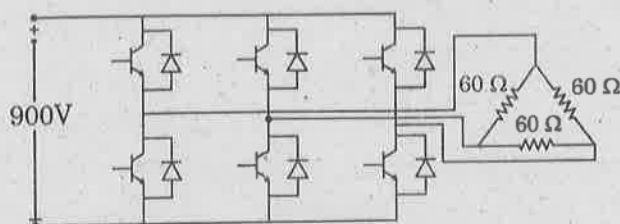
88. SiC-based devices withstand far higher voltages and temperatures than their silicon counterparts. This is due to

- High mobility
- High mechanical strength
- Smaller conduction time
- Silicon carbide electrons need almost three times more energy to reach the conduction band as compared to silicon to restrict armature current

89. Identify self-extinguishable device

- GTO
- Diode
- Schottky diode
- SCR

90. A three phase VSI fed from a 900V battery is shown in the figure. The resistive load of 60 Ω /phase is connected. At 180° conduction of solid-state devices, the power consumed by the load in kW is



- 9 kW
- 27 kW
- 15.59 kW
- 54 kW

91. For a buck-boost converter input voltage varies from 32V to 72V. Assume that all components are ideal, inductor current is continuous and output voltage is ripple free. The range of duty ratio D of the converter for which the output voltage remains constant at 48V is

- $1/3 \leq D \leq 2/3$
- $2/3 \leq D \leq 3/4$
- $2/5 \leq D \leq 3/5$
- $0 \leq D \leq 1$

92. A six-pulse thyristor bridge rectifier is connected to a balanced three-phase, 50 Hz AC source. Assuming that the DC output current of the rectifier is constant, the lowest harmonic component in the AC input current is

- 100 Hz
- 150 Hz
- 250 Hz
- 300 Hz

93. The 8085 instruction that can be employed for checking if the contents of Accumulator is an odd number, is:

- ORI 01 or RAL
- ANI 01 or RAR
- XRI 01 or RLC
- XRI FF or RLC

94. In the program shown, how many times the 'NOP' instruction is executed?

```
MVI A, 03
Repeat: RAL
        NOP
        JNC Repeat
```

- 7
- 9
- 3
- 1

95. The 8085 instruction that is relevant for receiving through the pin SID, employing serial communication, is:
- SERIAL IN
 - SIM – Set Interrupt Mask
 - IN 8-bit port address
 - RIM – Read Interrupt Mask
96. When Code Segment of μP 8086 contains 1234h and its Instruction pointer contains 9ABCh, the next instruction is fetched from:
- 9BDF4h
 - 1BDFCh
 - 9BD04h
 - 1BD0Ch
97. The address bus width and memory addressing capacity of μP 8086, are respectively:
- 16 bit long and 64 Kbyte
 - 8 bit long and 256 byte
 - 20 bit long and 1 Mbyte
 - 24 bit long and 16 Mbyte
98. A non-anticipative system is a
- Static System
 - Dynamic System
 - Causal System
 - Both b and c
99. If $x(n) = \{1, 2, 3, 0, 4, 0, 6\}$ then circularly shifted signal $x(n+2) =$
- $\{1, 2, 3, 0, 4, 0, 6, 0, 0\}$
 - $\{3, 0, 4, 0, 6, 1, 2\}$
 - $\{3, 4, 5, 0, 6, 0, 8\}$
 - $\{0, 0, 1, 2, 3, 0, 4, 0, 6\}$
100. A system described by $H(z) = z(z+1)/(z-2)(z+2)$. The initial value of the system is,
- 1
 - $-1/4$
 - -4
 - Infinite
101. The breakdown criterion in a uniform field electrode gap is
- $\alpha^{-\gamma d} = 1$
 - $\alpha = \frac{\eta}{(1-\gamma)}$
 - $\gamma e^{\alpha d} = 1$
 - $\gamma e^{-\alpha d} = 1$
102. Time lag for breakdown is
- time difference between instant of applied voltage and occurrence of breakdown
 - time taken for the voltage to rise before breakdown occurs
 - time required for gas to breakdown under pulse application
 - none of the above
103. Corona occurs before the breakdown in a sphere to ground air gap when ratio of gap distance to the radius of sphere is
- >1.0
 - >3.0
 - >10
 - <1.0
104. Minimum sparking potential of air is about
- 100 V
 - 4.4 kV
 - 40 V
 - 325 V
105. Winds having following speed are suitable to operate wind turbines.
- 5 – 25 m/s
 - 10 – 35 m/s
 - 20 – 45 m/s
 - 30 – 55 m/s

106. In testing with a resonant transformer, the output voltage is
- rectangular wave
 - triangular wave
 - trapezoidal wave
 - pure sine wave
107. The approximate value of time to front in an impulse voltage generator is
- $3R_1C_1$
 - $2.3R_1C_1$
 - $3R_1(C_1C_2)/(C_1 + C_2)$
 - $0.7(R_1 + R_2)(C_1 + C_2)$
108. A oscillatory impulse waveform is represented by
- $e^{-at} \cos bt$
 - $e^{at} \cos bt$
 - $e^{-at} \sin bt$
 - $e^{-at} - e^{-bt}$
109. Ward-Leonard controlled DC drives are generally used for _____ excavators.
- Light duty
 - Medium duty
 - Heavy duty
 - All the above
110. Which of the following motors are best suited for the rolling mills?
- Slip ring induction motor
 - Squirrel cage induction motor
 - DC motor
 - Synchronous motor
111. A 220V shunt motor takes 40A when running at 600 rpm. It has an armature resistance of 0.15Ω . Determine the armature current if the magnetic flux is weakened by 20%.
- 25A
 - 50A
 - 100A
 - 200A
112. Machines with more than two brush sets per pairs of poles are
- Metadynes
 - Amplidynes
 - Universal motor
 - Schrage motor
113. The unit of luminous flux is
- Watt/m
 - Lumen
 - Lumen/m
 - Lumen/m²
114. Which of the following instrument is used for comparison of candle powers of different sources?
- Photometer
 - Radiometer
 - Bunsen meter
 - Candle meter
115. The area under the speed - time curve represents the
- Acceleration of the train
 - Time taken by the train
 - Distance travelled by the train
 - Crest speed