

PART III

03 – ELECTRICAL AND ELECTRONICS ENGINEERING

(Answer ALL questions)

41. The resultant magnetic flux generated in the closed surface will be
- Zero
 - Continuous
 - Constant
 - Unity
42. The motion of electrons in a CRTs is due to
- Charge density
 - Columbic Force
 - Lorentz Force
 - Electron Gun
43. H in the region $0 \leq l \leq a$ for an infinitely long co-axial transmission line is
- $H = Il / 2\pi a^2$
 - $H = I / \pi a^2$
 - $H = 0$
 - $H = Il^3 / \pi a^2$
44. The direction of current flow in the circuit is such that the induced magnetic field produced by the induced current will oppose the original magnetic field. This is
- Faraday's Law
 - Lenz's Law
 - Biot - Savart Law
 - Gauss Law
45. The electromagnetic wave propagates in free space with a speed of
- 1.9×10^6 m/s
 - 3×10^8 m/s
 - 2.12×10^2 m/s
 - 3.8×10^4 m/s
46. Energy stored in the capacitor is
- $\frac{1}{2} CI^3$
 - $\frac{1}{2} CV^3$
 - $\frac{1}{2} CV^2$
 - $\frac{1}{2} CI^2$
47. 200 V, 50 Hz inductive circuit takes a current of 10 A lagging the voltage by 30°. Calculate inductance of the circuit
- 31.85 mH
 - 51.85 mH
 - 21.85 mH
 - 11.85 mH
48. Which of the following motors is expected to have maximum full-load efficiency
- 1 kW
 - 5 kW
 - 30 kW
 - 100 kW
49. Dynamic braking is very effective for
- DC series motor
 - DC shunt motor
 - Separately excited DC motor
 - Cumulatively compound DC motor
50. A transformer steps up the voltage by a factor of 100. The ratio of current in the primary to that in the secondary is
- 1
 - 100
 - 0.01
 - 0.1
51. Power factor of a power transformer on no load will be about
- 1
 - 0.75
 - 0.5
 - 0.35

52. To eliminate 5th harmonic voltage from the phase voltage of an alternator, the coils should be short pitched by an electrical angle of
- 30 degree
 - 36 degree
 - 72 degree
 - 18 degree
53. The flux set up by the armature current, which does not cross the air gap and takes a different path is called as
- Leakage flux
 - Main flux
 - Cross-magnetizing flux
 - Demagnetizing flux
54. AC machines should have proper _____ in order to limit the operating temperature
- Voltage rating
 - Current rating
 - Speed
 - kW rating
55. The nuclear plants are suitable for
- Peak load
 - Intermediate loads
 - Base load
 - Both base and peak loads
56. Corona loss increases with
- Decrease in conductor size and increase in supply frequency
 - Increase in conductor size and decrease in supply frequency
 - Increase in both conductor size and supply frequency
 - Decrease in both conductor size and supply frequency
57. Which of the following matrices reveals the topology of the power system network?
- Bus incidence matrix
 - Primitive impedance matrix
 - Primitive admittance matrix
 - Bus admittance matrix
58. Four identical alternators each rated for 20 MVA, 11 kV having a sub-transient reactance of 16% are working in parallel. The short circuit level at the bus bars is
- 700 MVA
 - 500 MVA
 - 300 MVA
 - 200 MVA
59. Magnetizing inrush current is rich in
- 3rd harmonics
 - 5th harmonics
 - 7th harmonics
 - 2nd harmonics
60. Negative phase sequence current in an alternator produces
- Over speed
 - Over voltage
 - Rotor heating
 - Under frequency
61. SVC is basically
- A FACTS controller connected to transmission line by series insertion transformer only
 - A compensator used to exchange real power at fundamental frequency
 - A series connected FACTS controller
 - A shunt connected FACTS controller
62. The Impulse Response of an initially relaxed linear system is $e^{-2t}u(t)$. To produce a response of $te^{-2t}u(t)$, the input should be
- $2e^{-t}u(t)$
 - $0.5 e^{-2t}u(t)$
 - $e^{-2t}u(t)$
 - $e^{-t}u(t)$

63. The steady state error due to unit acceleration input for a type 2 system is
- Zero
 - Infinity
 - $1/K_a$
 - $1/K_v$
64. A system has two zeros and four poles. Then two asymptotes in the root loci plane move towards infinity along
- ± 60 degree
 - ± 90 degree
 - ± 45 degree
 - ± 30 degree
65. A closed loop system has the characteristic equation given by $s^3 + ks^2 + (k + 2)s + 3 = 0$. For the system to be stable the value of k is
- $k > 1$
 - $0.5 < k < 1$
 - $0 < k < 1$
 - $0 < k < 0.5$
66. Loop transfer function of a feedback system is $G(s)H(s) = \frac{10}{(s-2)}$. Assume the Nyquist contour in the clockwise direction. Then the Nyquist plot of $G(s)$ encircles $-1 + j0$
- once in clockwise direction
 - twice in clockwise direction
 - once in anti-clockwise direction
 - twice in anti-clockwise direction
67. The transfer function of a first order controller is given as $G_c(s) = K(s + a) / (s + b)$, where K, a, b are positive real numbers. The condition for this controller to act as a phase lag compensator is
- $a < b$
 - $a > b$
 - $K < ab$
 - $K > ab$
68. The state variable description of a system is $\dot{X} = AX + BU$; $A = \begin{bmatrix} 0 & 3 \\ 3 & 0 \end{bmatrix}$. The poles of the system are located at
- $s = \pm 2$
 - $s = \pm j2$
 - $s = \pm j3$
 - $s = \pm 3$
69. In a single phase semi-converter without freewheeling diode, for discontinuous conduction and extinction angle $\beta > \pi$, each SCR conducts for the period
- $\pi - \alpha$
 - $\beta - \alpha$
 - α
 - β
70. For a single phase full wave uncontrolled rectifier with purely R load, the form factor is
- $\frac{2\sqrt{2}}{\pi}$
 - $\frac{2}{\pi}$
 - $\frac{\pi}{2\sqrt{2}}$
 - $\frac{\pi}{2}$
71. A single-phase inverter has square wave output voltage. The percentage of the fifth harmonic component in relation to the fundamental component is
- 10
 - 20
 - 30
 - 40

72. The RMS output voltage at fundamental frequency of a single phase, full bridge inverter with input voltage of 48V DC, feeding a load of 2.4Ω is
- $\frac{4 \times 48}{\sqrt{2} \pi} V$
 - $\frac{48}{2\sqrt{2} \pi} V$
 - $\frac{\sqrt{2} \times 48}{\pi} V$
 - $\frac{4 \times 48}{\pi} V$
73. When the MOSFET is in the ON state, the channel of the device behaves like
- Constant resistance
 - Inductance
 - Capacitance
 - Resistance and Inductance
74. The duty cycle value of buck converter when the switching frequency is 250 kHz and the ON time is $2 \mu s$ is
- 0.4
 - 0.8
 - 0.5
 - 0.2
75. Which load torque will be used in regenerative braking?
- Fan hype load torque
 - Frictional load torque
 - Passive load torque
 - Archive load torque
76. Assuming 3 MHz clock frequency, the execution time taken by the delay subroutine is :
- ```
Delay : MVI C, 9Ah
Loop : DCR C
 JNZ Loop
 RET
```
- 0.723 msec
  - 7.23 msec
  - 0.07231 msec
  - 72.34  $\mu sec$ .
77. The output of the following program is :
- ```
LXI H, 1234h
MVI C, 05h
MVI B, 67h
DCR C
DAD B
SHLD Result
HLT.
```
- 1234 h
 - 7938 h
 - 7939 h
 - 129 Bh
78. On execution of the program segment,
- ```
MVI A, 0Ah
SIM
....
```
- RST 6.5 is disabled, but other interrupts are enabled
  - RST 7.5 is disabled, but other interrupts are enabled.
  - RST 5.5 is disabled, but other interrupts are enabled.
  - Both RST 5.5 and RST 6.5 are disabled, but other interrupts are enabled.
79. The 8051 program segment, which performs 'software polling' to check if the timer-0 counting has completed, is:
- JNB TF0, 0FEh
  - JB TF0, 0FEh
  - JB TF1, 0FEh
  - JNB TF1, 0FEh

80. The output of the following 8051 Assembly code is,
- ```

MOV A, #10
MOV 01H, A
MOV A, #20
MOV @R1, A

```
- A = 10
 - [01] = 20
 - [10] = 20
 - [20] = 10
81. What is the operation carried out by the 8051 instruction: 'SETB 0D3'?
- It disables all of the interrupts temporarily
 - It doubles the baud rate of the serial communication
 - It switches to bank1 from the default bank0
 - It makes the timer-0 run in mode-3
82. If all the poles of H(z) are outside the unit circle, then the system is said to be
- Only causal
 - Only BIBO stable
 - BIBO stable and causal
 - None of the above
83. Which of the following is true regarding the number of computations required to compute N-point DFT
- N^2 complex multiplications and $N(N-1)$ complex additions
 - N^2 Complex additions and $N(N-1)$ complex multiplications
 - N^2 complex multiplications and $N(n+1)$ complex additions
 - N^2 complex additions and $N(N+1)$ complex multiplications
84. Which of the following justifies the linearity property of z-transform? $[x(n) \leftrightarrow X(z)]$.
- $x(n) + y(n) \leftrightarrow X(z)Y(z)$
 - $x(n) + y(n) \leftrightarrow X(z) + Y(z)$
 - $x(n) y(n) \leftrightarrow X(z) + Y(z)$
 - $x(n) y(n) \leftrightarrow X(z)Y(z)$
85. What is the width of the main lobe of the frequency response of a rectangular window of length M-1?
- π/M
 - $2\pi/M$
 - $4\pi/M$
 - $8\pi/M$
86. With reference to the Fast Fourier Transform if $W_4^1 = W_x^2$, then what is the value of x ?
- 2
 - 4
 - 8
 - 16
87. Which of the following defines the FIR filter for length M, input x(n) and output y(n)?
- $y(n) = \sum_{K=0}^M b_k x(n-k)$
 - $y(n) = \sum_{K=0}^{M+1} b_k x(n+k)$
 - $y(n) = \sum_{K=0}^{M-1} b_k x(n-k)$
 - $y(n) = \sum_{K=0}^M b_k x(n+k)$
88. Surge impedance of loss less transmission line is (if L = inductance/m C = capacitance/m)
- $\sqrt{C/L}$
 - $\sqrt{L/C}$
 - $1/\sqrt{LC}$
 - \sqrt{LC}
89. Time lag for breakdown is
- time required for gas to breakdown under pulse application
 - time taken for the voltage to rise before breakdown occurs
 - time difference between instant of applied voltage and occurrence of breakdown
 - time required for ionization
90. In impulse testing of transformers fault location is usually done by
- neutral current oscillogram
 - chopped wave oscillogram
 - observing for noise or smoke
 - scanning method

91. The breakdown strength of air for small gaps (1 mm) under uniform field condition and standard atmospheric conditions will be
- 50 kV/cm
 - 43.45 kV/cm
 - 25.58 kV/cm
 - 40.59 kV/cm
92. Optimum number of stages for Cockcroft Walton voltage multiplier circuit are
- $\sqrt{V_{\max}/If C}$
 - $\sqrt{If C/V_{\max}}$
 - $\sqrt{V_{\max}f/IC}$
 - $\sqrt{V_{\max}fC/I}$
93. The most important test to assert the proper functions of a surge diverter is
- 100% impulse withstand test
 - Front of wave spark over and residual voltage tests
 - Impulse current test
 - Pollution tests
94. An R-C voltage divider has an HV arm capacitance, $C_1 = 600$ pf, resistance = 400Ω and equivalent ground capacitance $C_g = 240$ pF. The effective time constant of the divider in nanoseconds is
- 32
 - 100
 - 67
 - 25
95. Electric traction uses power supply of
- 25 kV, AC, 50Hz
 - 25kV, DC
 - 50kV, AC, 50Hz
 - 50kV, DC
96. Filament lamps operate normally at a power factor of
- 0.6 lagging
 - 0.6 leading
 - Zero power factor
 - Unity power factor
97. Candela is the unit of
- Luminous flux
 - Luminous intensity
 - Light
 - Brightness
98. A slab of insulating material 130 cm^2 in area and 1 cm thick is to be heated by dielectric heating. The power required is 380 W at 30 MHz. The material has a relative permittivity of 5 and power factor of 0.05. Determine the necessary voltage
- 837 kV
 - 837 V
 - 652 V
 - 552 V
99. Spot welding is used for
- Thin metal sheets
 - Thick metal rods
 - Thick Square sections
 - Rough and irregular surfaces
100. Material used for solar cell is
- Germanium
 - Silicon
 - Silica gel
 - Mercury