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T.B.C. : B-DMHH-N-FFA

Test Booklet Series

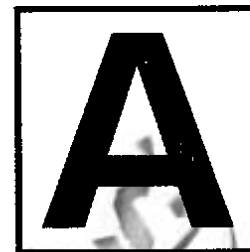
Serial

56721

TEST BOOKLET

ELECTRICAL ENGINEERING

PAPER I



Time Allowed : Two Hours

Maximum Marks : 200

INSTRUCTIONS

1. IMMEDIATELY AFTER THE COMMENCEMENT OF THE EXAMINATION, YOU SHOULD CHECK THAT THIS TEST BOOKLET DOES **NOT** HAVE ANY UNPRINTED OR TORN OR MISSING PAGES OR ITEMS, ETC. IF SO, GET IT REPLACED BY A COMPLETE TEST BOOKLET.
2. Please note that it is the candidate's responsibility to encode and fill in the Roll Number and Test Booklet Series Code A, B, C or D carefully and without any omission or discrepancy at the appropriate places in the OMR Answer Sheet. Any omission/discrepancy will render the Answer Sheet liable for rejection.
3. You have to enter your Roll Number on the Test Booklet in the Box provided alongside.
DO NOT write *anything else* on the Test Booklet.
4. This Test Booklet contains 120 items (questions). Each item comprises four responses (answers). You will select the response which you want to mark on the Answer Sheet. In case you feel that there is more than one correct response, mark the response which you consider the best. In any case, choose **ONLY ONE** response for each item.
5. You have to mark all your responses **ONLY** on the separate Answer Sheet provided. See directions in the Answer Sheet.
6. All items carry equal marks.
7. Before you proceed to mark in the Answer Sheet the response to various items in the Test Booklet, you have to fill in some particulars in the Answer Sheet as per instructions sent to you with your Admission Certificate.
8. After you have completed filling in all your responses on the Answer Sheet and the examination has concluded, you should hand over to the Invigilator **only the Answer Sheet**. You are permitted to take away with you the Test Booklet.
9. Sheets for rough work are appended in the Test Booklet at the end.
10. **Penalty for wrong answers :**
THERE WILL BE PENALTY FOR WRONG ANSWERS MARKED BY A CANDIDATE.
 - (i) There are four alternatives for the answer to every question. For each question for which a wrong answer has been given by the candidate, **one-third (0-33)** of the marks assigned to that question will be deducted as penalty.
 - (ii) If a candidate gives more than one answer, it will be treated as a **wrong answer** even if one of the given answers happens to be correct and there will be same penalty as above to that question.
 - (iii) If a question is left blank, i.e., no answer is given by the candidate, there will be **no penalty** for that question.

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1. The electric field lines and equipotential lines
 - (a) are parallel to each other
 - (b) are one and the same
 - (c) cut each other orthogonally
 - (d) can be inclined to each other at any angle

2. According to Gauss's Law, the surface integral of the normal component of electric flux density D over a closed surface containing charge Q is
 - (a) $\frac{Q}{\epsilon_0}$
 - (b) $\epsilon_0 Q$
 - (c) Q
 - (d) $\frac{Q^2}{\epsilon_0}$

3. Consider the following statements :
A current I flows through a circular coil of one turn of radius R in the counter-clockwise direction.
 1. The magnetic field at the centre is inversely proportional to R .
 2. The magnetic moment of the coil is directly proportional to R^2 .
 3. The magnetic field at its centre is directly proportional to R^2 .

Which of the above statements is/are correct ?

 - (a) 1 and 2
 - (b) 1 only
 - (c) 2 and 3
 - (d) 3 only

4. The depth of penetration of a wave in a lossy dielectric medium increases with
 - (a) Increasing wavelength
 - (b) Increasing conductivity
 - (c) Decreasing wavelength
 - (d) Increasing permittivity

5. Consider the following statements associated with the basic electrostatic properties of ideal conductors :
 1. The resultant field inside is zero.
 2. The net charge density in the interior is zero.
 3. Any net charges reside on the surface.
 4. The surface is always equipotential.
 5. The field just outside is zero.

Which of the above statements are correct ?

 - (a) 1, 2, 3 and 4
 - (b) 3, 4 and 5 only
 - (c) 1, 2 and 3 only
 - (d) 2 and 3 only

6. In practice, Earth is chosen as a place of zero electric potential because it
 - (a) is non-conducting
 - (b) is easily available reference
 - (c) keeps losing and gaining electric charge every day
 - (d) has almost constant potential

7. The capacitance of a concentric spherical capacitor of shell radii x and y ($x > y$) is
 - (a) $\frac{1}{4\pi\epsilon_0} \ln \frac{x}{y}$
 - (b) $\frac{4\pi\epsilon_0 xy}{x - y}$
 - (c) $4\pi\epsilon_0 \ln \frac{y}{x}$
 - (d) $\frac{1}{4\pi\epsilon_0} \left[\frac{1}{y} - \frac{1}{x} \right]$

8. The frequency of the power wave associated with an electromagnetic wave having an E field as $E = e^{-z/\delta} \cos(\omega t - \frac{z}{\delta})$, is given by
- $\frac{\omega}{8\pi}$
 - $\frac{\omega}{4\pi}$
 - $\frac{\omega}{2\pi}$
 - $\frac{\omega}{\pi}$
9. When the wave travels in a conducting medium, the rate of attenuation is decided by
- Attenuation constant
 - Phase constant
 - Both attenuation constant and phase constant
 - Neither attenuation constant nor phase constant
10. Uniform plane wave is
- Longitudinal in nature
 - Transverse in nature
 - Neither longitudinal nor transverse in nature
 - x-directed
11. The impedance Z offered by transmission line for a travelling wave which damps out the low frequency oscillation rapidly is also called
- Surge impedance
 - Natural impedance
 - Both surge and natural impedances
 - Neither surge nor natural impedance
12. In a coaxial transmission line, the useful power flows through
- the interface of the two conductors
 - both inner and outer conductors
 - inner conductor
 - outer conductor
13. For a line to have a purely resistive characteristic impedance
- $\frac{C}{G} = \frac{R}{L}$
 - $\omega L = \frac{1}{\omega C}$
 - $R = G$
 - $GL = RC$
- where R and G are resistance and conductance per unit length respectively and L and C are inductance and capacitance per unit length respectively.
14. A semiconductor device made out of a material having very high temperature coefficient of resistance is
- Transistor
 - Varistor
 - Thyristor
 - Thermistor
15. The electrical conductivity of a semiconductor increases with increase in temperature because
- the carrier concentration increases
 - the mobility of carrier increases
 - both carrier concentration and mobility increase
 - the band gap decreases
16. Which of the following are associated with soft superconductors ?
- Silsbee's rule
 - Meissner effect
 - Faraday rotation
 - Curie-Weiss law
- 2, 3 and 4
 - 1 and 3 only
 - 1 and 2 only
 - 2 and 3 only

17. In a two-channel oscilloscope operating in x-y mode, two in-phase 50 Hz sinusoidal waveforms of equal amplitude are fed to the two channels. What will be the resultant pattern on the screen ?
- An ellipse
 - A parabola
 - Straight line inclined at 45° with respect to x-axis
 - A circle
18. Materials, whose resistivity at very low temperatures plunges from a finite value to zero and remains there upon further cooling, are known as
- Ferromagnetic materials
 - High-energy hard magnetic materials
 - Superconductors
 - Ferrimagnetic materials
19. In a superconductor, if the temperature is decreased below its critical temperature, the value of critical magnetic field will
- Increase
 - Decrease
 - Not change
 - Increase or decrease depending on the superconductor material
20. The imaginary part of dielectric constant determines
- Component of current which is in phase with the applied field
 - Component of energy absorbed per m^3
 - Amount of applied field
 - Component of voltage which is in phase with the applied field
21. Curie law of paramagnetism (with χ = susceptibility, B = flux density and C = a constant) is
- $\chi = CT$
 - $\chi = \frac{CB}{T}$
 - $\chi = \frac{CT^2}{2B}$
 - $\chi = \frac{C}{T}$
22. If the magnetic susceptibility of a specimen is small and positive, the specimen is
- Diamagnetic
 - Paramagnetic
 - Ferromagnetic
 - Non-magnetic
23. Manganese ferrite is a 1 : 1 mixture of
- Manganese nitride and iron oxide
 - Manganese oxide and iron oxide
 - Manganese nitride and iron sulphide
 - Manganese oxide and iron sulphide
24. When a ferromagnetic substance is magnetized, small changes in dimensions occur. Such a phenomenon is known as
- Magnetic hysteresis
 - Magnetic expansion
 - Magnetostriction
 - Magneto-calorisation
25. In ferromagnetic, anti-ferromagnetic and ferrimagnetic materials, the atomic thermal motions counteract the coupling forces between the adjacent atomic dipole moments, thereby causing
- Some dipole misalignment regardless of whether an external field is present
 - Increase in dipole alignment regardless of whether an external field is present
 - No effect on dipole alignment
 - Atoms tend to de-randomize the direction of moments

26. The Hall Effect voltage in intrinsic silicon
- is positive
 - is zero
 - is negative
 - changes its sign based on application of magnetic field

27. Most outstanding property of indium antimonide is

- A very wide range gap
- High resistivity at room temperature
- High carrier mobility
- Very low conductivity at room temperature

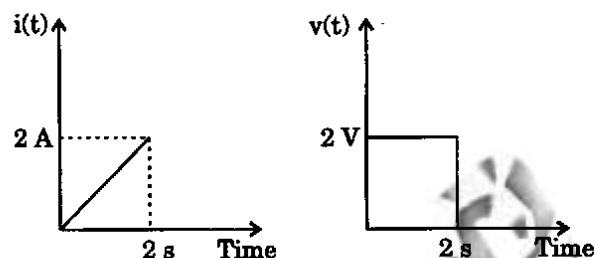
28. Which of the following semiconducting compounds is used in photoconductive devices?

- Caesium antimonide
- Barium oxide
- Lead sulphide
- Zinc oxide

29. A magnetic ring has a mean circumference of 20 cm and a cross-section of 20 cm^2 and has 800 numbers of turns of wire. When the exciting current is 5 A, the flux is 2 mWb. The relative permeability of iron is nearly

- 3.98
- 398
- 0.398
- 39.8

30. The voltage and current waveforms for an element are shown in the figures.



The circuit element and its value are

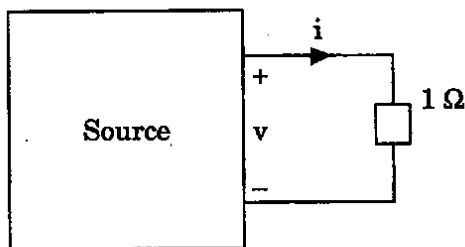
- Capacitor and 2 F
 - Inductor and 1 H
 - Inductor and 2 H
 - Resistor and 1Ω
31. For a series R-C circuit, the power factor corresponding to maximum power is
- 0.5 lag
 - 0.5 lead
 - 0.707 lag
 - 0.707 lead
32. The power consumed by a coil is 300 W when connected to a 30 V dc source and 108 W when connected to a 30 V ac source. The reactance of the coil is
- 3Ω
 - 4Ω
 - 5Ω
 - 6.67Ω
33. A conductor of diameter d , length l consumes a power of W when a current I flows through it. What will be the power consumed if d is doubled, l is halved and current is tripled?
- 18 W
 - 36 W
 - 48 W
 - 72 W

34. When a source is delivering maximum power to a load, the efficiency of the circuit is always
- 50%
 - 75%
 - 100%
 - Depends on the circuit parameters
35. Consider the following statements :
Any element connected in
- Series with an ideal current source is redundant.
 - Parallel with an ideal current source is redundant.
 - Series with an ideal voltage source is redundant.
 - Parallel with an ideal voltage source is redundant.
- Which of the above statements is/are correct ?
- 1 only
 - 2 and 3
 - 2 only
 - 1 and 4
36. A battery charger can drive a current of 5 A into a $1\ \Omega$ resistance connected at its output terminals. If it is able to charge an ideal 2 V battery at 7 A rate, then Thevenin's equivalent will be
- 7.5 V in series with $0.5\ \Omega$
 - 12.5 V in series with $1.5\ \Omega$
 - 7.5 V in parallel with $0.5\ \Omega$
 - 12.5 V in parallel with $1.5\ \Omega$
37. The output power of a filter is 100 mW, when the signal frequency is 5 kHz. When the frequency is increased to 25 kHz, the output power falls to 50 mW. What is the dB change in power ?
- 3 dB
 - 5 dB
 - 7 dB
 - 2 dB
38. The principle of operation used in capacitive transducers to measure level of liquid is change of
- Area of plates
 - Dielectric strength
 - Distance between plates
 - Shape of plates
39. In any network the current will be seen to be consisting of a forced current and a natural current. A forced current is
- A steady-state current with external source but a natural current is a transient current in a closed circuit with no external source.
 - A transient current with external source but a natural current is a steady-state current in a closed circuit with no external source.
 - A steady-state current in a closed circuit without external source, while a natural current is a transient current with an external source.
 - A transient current in a closed circuit without external source, while a natural current is a steady-state current with an external source.
40. A coil of resistance $10\ \Omega$ and inductance $0.8\ \text{H}$ is connected to a 200 V dc supply. The initial rate of change of current is
- 16 A/s
 - 160 A/s
 - 250 A/s
 - 4000 A/s

41. There are no transients in pure resistance circuits because they

- (a) Offer high resistance
- (b) Obey Ohm's law
- (c) Have no stored energy
- (d) Are linear circuits

42. As shown in the figure, $1\ \Omega$ resistance is connected across a source that has a load line $v + i = 100$. The current through the resistance is

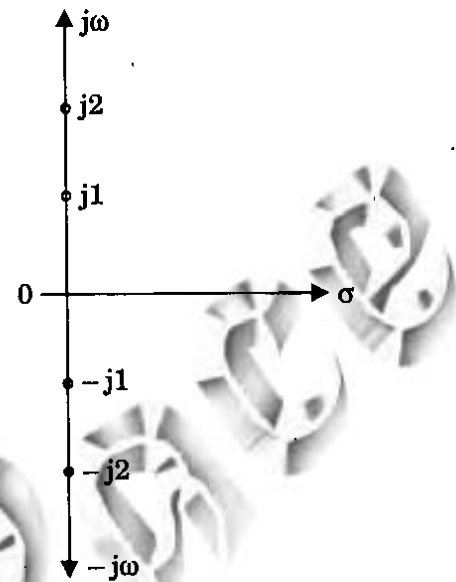


- (a) 25 A
- (b) 50 A
- (c) 100 A
- (d) 200 A

43. The initial and final values of $f(t) = 15 - 10t - 10e^{-20t}$ are respectively

- (a) 5 and ∞
- (b) 5 and $-\infty$
- (c) 15 and ∞
- (d) 15 and 10

44. The pole-zero pattern of a certain filter is shown in figure. The filter must be



- (a) Low-pass type
- (b) High-pass type
- (c) Band-pass type
- (d) All-pass type

45. A single-phase ac voltage source has 200 V rms and a system connected consumes an active power of 300 W. What is the reactive power consumed by the system if 2.5 A rms current is drawn?

- (a) 100 VAR
- (b) 200 VAR
- (c) 300 VAR
- (d) 400 VAR

46. The transfer function of a low-pass RC network is

- (a) $RCs(1 + RCs)$
- (b) $\frac{1}{(1 + RCs)}$
- (c) $\frac{RC}{(1 + RCs)}$
- (d) $\frac{s}{(1 + RCs)}$

47. An RLC resonant circuit has a resonance frequency of 1.5 MHz and bandwidth of 10 kHz. If $C = 150 \text{ pF}$, then effective resistance of the circuit will be
- 29.5 Ω
 - 14.75 Ω
 - 9.5 Ω
 - 4.7 Ω
48. Consider the following two types of non-identical sources :
- Voltage sources $e_1(t)$ and $e_2(t)$
 - Current sources $i_1(t)$ and $i_2(t)$
- Regarding the mode of their connection in a circuit,
- 1 cannot be connected in parallel, and 2 cannot be connected in series
 - 1 cannot be connected in series, and 2 cannot be connected in parallel
 - Both 1 and 2 cannot be connected in series
 - Both 1 and 2 cannot be connected in parallel
49. In a series resonant circuit, maximum voltage across L occurs at
- Resonant frequency
 - Slightly below resonant frequency
 - Slightly above resonant frequency
 - At a frequency where I is maximum
50. Two wattmeters are used to measure the power in a 3-phase balanced system. What is the power factor of the load when one wattmeter reads twice the other ?
- 0
 - 0.5
 - 0.866
 - 1
51. In a balanced 3-phase 200 V circuit, the line current is 115.5 A. When the power is measured by two wattmeter method, one of the wattmeters reads 20 kW and the other one reads zero. What is the power factor of the load ?
- 0.5
 - 0.6
 - 0.7
 - 0.8
52. A coil having an inductance of 0.5 H and a resistance of 60 Ω is connected in series with a capacitance of 10 μF . The coil is connected to 100 V ac supply. What is the source frequency and current flowing in the circuit under resonance condition ?
- 7.121 Hz and 16.7 A
 - 7.121 Hz and 1.67 A
 - 71.21 Hz and 16.7 A
 - 71.21 Hz and 1.67 A
53. Three equal impedances are first connected in delta across a 3-phase balanced supply. If the same impedances are connected in star across the same supply then,
- Phase current will be one-third
 - Line current will be one-third
 - Power consumed will be one-third
 - Phase current will remain the same
54. A Hurwitz polynomial $D(s)$ must satisfy two conditions. One is the polynomial is real when s is real. What is the other condition ?
- Roots of $D(s)$ have real parts which are positive and non-zero
 - Roots of $D(s)$ have imaginary parts which are negative
 - Roots of $D(s)$ have real parts which are either zero or negative
 - Roots of $D(s)$ have real parts which are positive or zero

55. The unit impulse response of a system is given as $c(t) = -4e^{-t} + 6e^{-2t}$. The step response of the same system for $t \geq 0$ is equal to

- (a) $3e^{-2t} + 4e^{-t} + 1$
- (b) $-3e^{-2t} + 4e^{-t} + 1$
- (c) $-3e^{-2t} + 4e^{-t} - 1$
- (d) $3e^{-2t} - 4e^{-t} + 1$

56. Four ammeters M_1 , M_2 , M_3 and M_4 with the following specifications are available. (Full scale, accuracy value as percentage of FS)

$M_1 = 20 \pm 0.10$; $M_2 = 10 \pm 0.20$; $M_3 = 5 \pm 0.50$; and $M_4 = 1 \pm 1.00$

A current of 1 A is to be measured. To obtain minimum error in the reading one should select meter

- (a) M_1
- (b) M_2
- (c) M_3
- (d) M_4

57. In an induction type energy meter, the steady speed attained by the rotating disc is

1. Proportional to the deflecting torque.
2. Proportional to the resistance of the path of eddy currents.
3. Inversely proportional to the effective readings of disc from its axis.
4. Inversely proportional to the square of brake magnet flux.

Which of the above are correct ?

- (a) 1, 2 and 3 only
- (b) 1, 2 and 4 only
- (c) 2, 3 and 4 only
- (d) 1, 2, 3 and 4

58. Consider the following functions :

1. $\frac{(s^2 + 1)(s^2 + 3)}{s(s^2 + 2)}$
2. $\frac{s(s^2 + 1)(s^2 + 3)}{(s^2 + 0.5)(s^2 + 2)}$
3. $\frac{(s^4 + 4s^2 + 3)}{s^2 + 2s}$
4. $\frac{s^5 + 4s^3 + 3s}{s^4 + 2.5s + 1}$

Which of the above functions are LC driving point impedances ?

- (a) 1, 2, 3 and 4
- (b) 2 and 3 only
- (c) 1 and 2 only
- (d) 3 and 4 only

59. A dc voltmeter has a sensitivity of $1000 \Omega/V$. When it measures half full scale in 100 V range, the current through the voltmeter is

- (a) 100 mA
- (b) 50 mA
- (c) 1 mA
- (d) 0.5 mA

60. Two wattmeter method is employed to measure power in a 3-phase balanced system with the current coil connected in the A and C lines. The phase sequence is ABC. If the wattmeter with its current coil in A-phase line reads zero, then the power factor of the 3-phase load will be

- (a) Zero lagging
- (b) Zero leading
- (c) 0.5 lagging
- (d) 0.5 leading

61. In moving iron instruments, eddy current damping *cannot* be used as
- They have a strong operating magnetic field
 - They are not normally used in vertical position
 - They need a large damping force, which can only be provided by air friction
 - The introduction of a permanent magnet required for eddy current damping would distort the existing weak operating magnetic field
62. A basic D'Arsonval movement showing full scale deflection for a current of $50\ \mu\text{A}$ and having internal resistance of $500\ \Omega$ is used as a voltmeter. What is the value of multiplier resistance needed to measure a voltage range of $0 - 20\ \text{V}$?
- $398.5\ \text{k}\Omega$
 - $399\ \text{k}\Omega$
 - $399.5\ \text{k}\Omega$
 - $400\ \text{k}\Omega$
63. One single-phase energy meter operating on $230\ \text{V}$ and $5\ \text{A}$ for 5 hours makes 1940 revolutions. Meter constant is $400\ \text{rev/kWh}$. The power factor of the load is
- 1.0
 - 0.8
 - 0.7
 - 0.6
64. In De Sauty Bridge (unmodified form) it is possible to obtain balance
- Even if both the capacitors are imperfect
 - If one of the capacitors is perfect
 - Only if both the capacitors are perfect
 - All of the above
65. The current coil of a single-phase energy meter is wound on
- One limb of the laminated core
 - Both the limbs of the laminated core with same number of turns
 - Both the limbs of the laminated core with different number of turns
 - The centre of the limb on the laminated core
66. For controlling the vibration of the disc of ac energy meter, damping torque is produced by
- Eddy current
 - Chemical effect
 - Electrostatic effect
 - Magnetic effect
67. The meter constant of a single-phase $230\ \text{V}$ induction watt hour meter is 400 revolutions per kWh. The speed of the meter disc for a current of $10\ \text{A}$ of $0.9\ \text{pf}$ lagging will be
- $13.80\ \text{rpm}$
 - $16.02\ \text{rpm}$
 - $18.20\ \text{rpm}$
 - $21.10\ \text{rpm}$
68. A galvanometer has a current sensitivity of $1\ \mu\text{A/mm}$ and a critical damping resistance of $1\ \text{k}\Omega$. The voltage sensitivity and the meg-ohm sensitivity respectively are
- $1\ \text{mV/mm}$ and $1\ \text{M}\Omega$
 - $1\ \text{mV/mm}$ and $2\ \text{M}\Omega$
 - $2\ \text{mV/mm}$ and $2\ \text{M}\Omega$
 - $2\ \text{mV/mm}$ and $1\ \text{M}\Omega$
69. Electrostatic voltmeters are particularly suitable for measuring high voltages because the construction is simplified due to
- Large electrostatic forces
 - Small electrostatic forces
 - Large value of current
 - Small value of current

70. A moving coil instrument of resistance $5\ \Omega$ requires a potential difference of 75 mV to give a full scale deflection. The value of shunt resistance needed to give a full scale deflection at 30 A is
- 2.5 m Ω
 - 9.99 m Ω
 - 5 Ω
 - 9.95 Ω
71. The function of input attenuators in measuring instruments, like VTVM and CRO, is to
- Increase the input impedance
 - Attenuate the frequency range
 - Attenuate the input signal amplitude without altering the frequency contents
 - Attenuate the input impedance
72. With the help of which bridge are the capacitance and dielectric loss of a capacitor generally measured?
- De Sauty
 - Wien series
 - Anderson
 - Schering
73. The deflection of a hot wire instrument depends on
- Instantaneous value of alternating current
 - Average value of current
 - RMS value of alternating current
 - Voltage instead of current
74. A DVM uses 10 MHz clock and has a voltage controlled generator which provides a width of 5 μ s/volt of unit signal. 10 V input signal would correspond to a pulse count of
- 500
 - 750
 - 250
 - 1000
75. A resistance strain gauge with a gauge factor of 2.0 is fastened to a steel member subjected to a stress of 100 N/mm². The modulus of elasticity of steel is approximately 2×10^5 N/mm². The percentage change in resistance is
- 1.50
 - 1.00
 - 0.15
 - 0.10
76. The resistance of 125 Ω strain gauge changes by 1 Ω for 4000 micro-strain. The gauge factor for strain gauge is
- 1.5
 - 2.0
 - 2.5
 - 3.0
77. Delay line is essential in a CRO, to ensure that
- Vertical signal starts after the retrace period of sweep signal
 - The sweep reaches the horizontal plates before the desired signal under consideration
 - Initial part of signal to be observed is not lost
 - All of the above

78. Which of the following ADC has highest accuracy ?

- (a) Successive approximation type
- (b) Flash or parallel type
- (c) Single slope integration type
- (d) Dual slope integration type

79. Consider the following transducers :

- 1. LVDT
- 2. Piezoelectric
- 3. Thermocouple
- 4. Photovoltaic cell

Which of the above are active transducers ?

- (a) 1, 2 and 3
- (b) 1, 2 and 4
- (c) 2 and 3 only
- (d) 2, 3 and 4

80. A unity feedback second order control system is characterized by the open loop transfer function $(s) = \frac{K}{s(Js + B)}$.

J = moment of inertia, B = damping constant and K = system gain

The transient response specification which is not affected by system gain variation is

- (a) Peak overshoot
- (b) Rise time
- (c) Settling time
- (d) Time to peak overshoot

81. The dominant poles of a servo-system are located at $s = (-2 \pm j2)$. The damping ratio of the system is

- (a) 1
- (b) 0.8
- (c) 0.707
- (d) 0.6

82. For a unity feedback control with $G(s) = \frac{9}{s(s+3)}$, the damping ratio is

- (a) 0.5
- (b) 1
- (c) 0.707
- (d) 0.33

83. The overall transfer function of a second order control system is given by,

$$\frac{C(s)}{R(s)} = \frac{2}{s^2 + 3s + 2}$$

The time response of this system, when subjected to a unit step response is

- (a) $1 - e^{-2t} + 2e^{-t}$
- (b) $1 + e^{-2t} + 2e^{-t}$
- (c) $1 - 2e^{-t} + e^{-2t}$
- (d) $1 + e^{-2t}$

84. The position and velocity error coefficients for the system of transfer function,

$$G(s) = \frac{50}{(1 + 0.1s)(1 + 2s)}$$

are respectively

- (a) Zero and zero
- (b) Zero and infinity
- (c) 50 and zero
- (d) 50 and infinity

85. Consider the open-loop transfer function :

$$G(s)H(s) = \frac{5(s+1)}{s^2(s+5)(s+12)}$$

The steady-state error due to a ramp input is

- (a) 0
(b) 5
(c) 12
(d) ∞
86. What will be the gain margin in dB of a system having the following open loop transfer function ?

$$G(s)H(s) = \frac{2}{s(s+1)}$$

- (a) 0
(b) 2
(c) $\frac{1}{2}$
(d) ∞
87. For a unit step input, a system with forward path transfer function

$$G(s) = \frac{20}{s^2}$$

and feedback path transfer function $H(s) = (s+5)$ has a steady-state output of

- (a) 2
(b) 0.5
(c) 1
(d) 0.2
88. By adding a pole at the origin of s-plane, the Nyquist plot of a system will rotate by
- (a) 90° in anti-clockwise direction
(b) 90° in clockwise direction
(c) 180° in anti-clockwise direction
(d) 180° in clockwise direction
89. The characteristic equation of a feedback control system is

$$s^4 + s^3 + 2s^2 + 4s + 15 = 0.$$

The number of roots in the right half of the s-plane is

- (a) 4
(b) 3
(c) 2
(d) 1

90. In the Bode plot of a unity feedback control system, the value of phase of $G(j\omega)$ at the gain cross-over frequency is -125° . The phase margin of the system is

- (a) -125°
(b) -55°
(c) 55°
(d) 125°

91. The correct sequence of steps needed to improve system stability is

- (a) Insert derivation action, Use negative feedback and Reduce gain
(b) Reduce gain, Use negative feedback and Insert derivation action
(c) Reduce gain, Insert derivation action and Use negative feedback
(d) Use negative feedback, Reduce gain and Insert derivation action

92. Which of the following points is *not* on the root locus of a system with the given open loop transfer function ?

$$G(s)H(s) = \frac{K}{s(s+1)(s+3)}$$

- (a) $s = -j\sqrt{3}$
(b) $s = -1.5$
(c) $s = -3$
(d) $s = -\infty$

93. The effect of integral controller on the steady-state error e_{ss} and that on the relative stability R_s of the system is

- (a) Both are increased
(b) e_{ss} is increased but R_s is reduced
(c) e_{ss} is reduced but R_s is increased
(d) Both are reduced

94. The state equations in the phase variable canonical form can be obtained from the transfer function by

- (a) Cascade decomposition
- (b) Direct decomposition
- (c) Inverse decomposition
- (d) Parallel decomposition

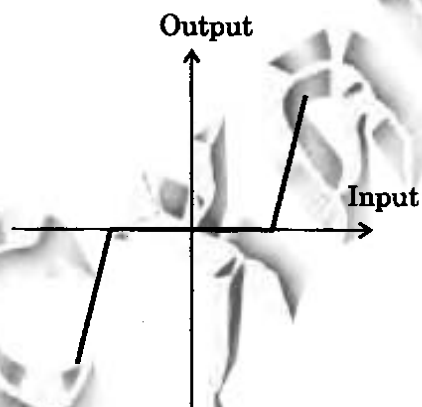
95. The transfer function of a zero order hold is given by

- (a) $\frac{1}{s}$
- (b) $1 - e^{-Ts}$
- (c) $s(1 - e^{-Ts})$
- (d) $\frac{1 - e^{-Ts}}{s}$

96. With negative feedback, the system stability and system gain respectively

- (a) Increases and increases
- (b) Increases and decreases
- (c) Decreases and increases
- (d) Decreases and decreases

97.



This non-linearity represents

- (a) Dead zone
- (b) Coulomb friction
- (c) Saturation
- (d) Hysteresis

98. What is the number of turns of wire needed to provide a potentiometer with a resolution of 0.05 percent ?

- (a) 200 turns
- (b) 2000 turns
- (c) 20 turns
- (d) 20000 turns

99. Consider the following properties attributed to state model of a system :

1. State model is unique.
2. Transfer function for the system is unique.
3. State model can be derived from transfer function of the system.

Which of the above statements are correct ?

- (a) 1, 2 and 3
- (b) 1 and 2 only
- (c) 2 and 3 only
- (d) 1 and 3 only

100. A discrete time system is stable if all the roots of the characteristic equation lie

- (a) Outside the circle of unit radius
- (b) Within the circle of unit radius
- (c) Outside the circle of radius equal to 3-units
- (d) On the circle of infinite radius

Directions : Each of the next **twenty (20)** 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

101. Statement (I) :

At 50 Hz the depth of penetration is 8.5 mm.
At 30 GHz the depth of penetration is 0.00038 mm.

Statement (II) :

A high frequency field attenuates as it penetrates conduction in a shorter distance than a low frequency field.

102. Statement (I) :

A semi-conductor is not capable of sustaining the movement of free negative electrons, but capable of positive charges or holes.

Statement (II) :

The positive charges cannot be positrons because to liberate the latter, an energy as high as one million eV or more would be required.

103. Statement (I) :

Hard magnetic materials are used for making permanent magnets.

Statement (II) :

Hard magnetic materials have relatively small and narrow hysteresis loop.

104. Statement (I) :

Servo motors have small diameter and large axial length.

Statement (II) :

Servo motors must have low inertia and high starting torque.

105. Statement (I) :

The magnetic moments of diamagnetic materials are mainly due to the orbital angular momentum of the electrons.

Statement (II) :

A steady current flowing in the orbit produces a magnetic field equivalent to that set up by a dipole perpendicular to the plane of orbit (Ampere's law).

106. Statement (I) :

Under steady-state condition, a pure capacitor behaves as an open circuit for direct voltage.

Statement (II) :

The current through a capacitor is proportional to the rate of change of voltage.

107. Statement (I) :

During resonance, an R-L-C series circuit behaves like a purely resistive circuit.

Statement (II) :

During resonance in an R-L-C series circuit, the voltages across the L- and the C-elements are in phase to each other.

108. Statement (I) :

The simplest method of power measurement is by means of electrodynamic type wattmeters, having two fixed coils, and one moving coil.

Statement (II) :

Either of the fixed and the moving coils can be used as the current or the voltage coils.

109. Statement (I) :

A permanent magnet moving coil instrument is always slightly under damped.

Statement (II) :

The pointer of the PMMC instrument should overshoot a little beyond the steady-state position to give the accurate reading.

110. Statement (I) :

Bridge measurements are considered to be more accurate as compared to measurements done using indicating instruments.

Statement (II) :

In a bridge measurement, the accuracy of the components used in the different arms of the bridge alone comes into picture.

111. Statement (I) :

RF voltage is measured by rectifying the alternating voltage first and then amplifying the resulting dc output.

Statement (II) :

Amplification of RF signal itself is very difficult.

112. Statement (I) :

Before making any voltage measurement using electronic voltmeter, it is desirable to short circuit its input and make zero-adjustment to ensure correct reading.

Statement (II) :

Drift in the dc amplifier of the electronic voltmeter may indicate output without any input voltage present.

113. Statement (I) :

Platinum resistance thermometers are widely used for temperature measurements for variety of industrial applications.

Statement (II) :

Platinum resistance thermometers provide the highest temperature sensitivity as compared to all known temperature transducers.

114. Statement (I) :

Flash analog-to-digital conversion is the fastest but an expensive method for designing ADCs.

Statement (II) :

Flash analog-to-digital converters are employed on very high speed digital acquisition systems.

115. Statement (I) :

Transfer function approach is inadequate, when time domain solution is required.

Statement (II) :

All initial conditions of the system are neglected in derivation of transfer function.

116. Statement (I) :

The polar plot has limitation for portraying the frequency response of a system.

Statement (II) :

The calculation of frequency response is tedious and does not indicate the effect of the individual poles and zeros.

117. Statement (I) :

A large resonance peak in frequency response also corresponds to a large peak overshoot in transient response.

Statement (II) :

All the systems which exhibit overshoot in time response will also exhibit resonance peak in frequency response.

118. Statement (I) :

The state feedback design is more realistic than conventional fixed configuration controller design.

Statement (II) :

The disadvantage with the state feedback is that all the states must be sensed and fed back for control.

119. Statement (I) :

For radar tracking systems, signals are available in the form of pulse trains.

Statement (II) :

The stability of a discrete-time system is decreased as the sampling period is shortened.

120. Statement (I) :

Soft magnetic materials are not used in the construction of permanent magnets.

Statement (II) :

Soft magnetic materials have narrow hysteresis loop, low retentivity and low coercivity.

SPACE FOR ROUGH WORK



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T.B.C. : B-DMHH-N-FFB

Test Booklet Series

Serial No.

55453

TEST BOOKLET

ELECTRICAL ENGINEERING

Paper II

A

Time Allowed : Two Hours

Maximum Marks : 200

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THERE WILL BE PENALTY FOR WRONG ANSWERS MARKED BY A CANDIDATE.
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 - (ii) If a candidate gives more than one answer, it will be treated as **wrong answer** even if one of the given answers happens to be correct and there will be same penalty as above to that question.
 - (iii) If a question is left blank i.e., no answer is given by the candidate, there will be **no penalty** for that question.

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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) 150 V
 - (b) 125 V
 - (c) 100 V
 - (d) 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 l.v. side voltage would be
 - (a) 300 V
 - (b) 250 V
 - (c) 200 V
 - (d) 150 V
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) 1.2 V
 - (b) 12 V
 - (c) 120 V
 - (d) 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
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
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%
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
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

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

10. A dc series motor with a resistance between terminals of $1\ \Omega$, 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) $2.5\ \Omega$
- (b) $3\ \Omega$
- (c) $4.5\ \Omega$
- (d) $5\ \Omega$

11. A dc series motor of resistance $1\ \Omega$ across terminals runs at 1000 rpm at 250 V taking a current of 20 A. When an additional resistance of $6\ \Omega$ 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

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

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

14. The synchronous reactance of a 500 V, 50 kVA alternator having an effective resistance of $0.2\ \Omega$, if an excitation current of 10 A produces 200 A armature current on short circuit and an emf of 450 volts on open circuit, is

- (a) $2.6\ \Omega$
- (b) $5.2\ \Omega$
- (c) $2.24\ \Omega$
- (d) $4.5\ \Omega$

15. The main advantage of distributing the winding in slots is to
- Reduce the size of the machine
 - Add mechanical strength to the winding
 - Reduce the amount of copper required
 - Reduce the harmonics in the generated emf
16. When the rotor speed, in a synchronous machine, becomes more than the synchronous speed during hunting, the damper bars develop
- Induction motor torque
 - Induction generator torque
 - Synchronous motor torque
 - DC motor torque
17. In a split phase motor, the running winding should have
- High resistance and low inductance
 - High resistance as well as high inductance
 - Low resistance and high inductance
 - Low resistance as well as low 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
- 0.16 kW
 - 0.32 kW
 - 1.6 kW
 - 3.2 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 capacitor across the mains
 - A capacitor in series with the machine
 - A capacitor in series with the auxiliary winding
 - The main and the auxiliary winding in series
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
- 1.9
 - 1.8
 - 2.4
 - 3.2

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
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
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
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
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
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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

47. In case of amplifiers, which coupling gives the highest gain?

- (a) Transformer coupling
- (b) Resistance coupling
- (c) Impedance coupling
- (d) Capacitance coupling

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

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

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

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

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

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

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

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

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

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

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

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

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

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) 1 and 2 only
 - (b) 2 and 3 only
 - (c) 1 and 3 only
 - (d) 1, 2 and 3

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

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

- (a) 80286
- (b) 80386
- (c) 80486
- (d) Pentium

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

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

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

- (a) 2
- (b) 3
- (c) 4
- (d) 5

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

- (a) RET
- (b) PCHL
- (c) POP PSW
- (d) DAD SP

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

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

70. The address lines A_{15} to A_9 of a micro-processor with 64 K 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

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

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

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

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

75. A 100 V 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

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

- (a) FM has infinite number of sidebands
- (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

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

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

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

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

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

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 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

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 amplifiers
- (d) Limiting the signal level using a clipper in the audio section

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

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

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 kbps
- (d) 128 Mbps

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

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

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

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

- (a) SCR
- (b) MOSFET
- (c) IGBT
- (d) TRIAC

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

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

93. Which of the following is the fastest switching device ?

- (a) JFET
- (b) BJT
- (c) MOSFET
- (d) Triode

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 rise
- (d) 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

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

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

- (a) L - R snubber polarized
- (b) R - C snubber polarized
- (c) R - C snubber unpolarized
- (d) L - R snubber unpolarized

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

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

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

101. In a 3- ϕ controller bridge rectifier, the maximum conduction of each Thyristor is

- (a) 60°
- (b) 90°
- (c) 120°
- (d) 150°

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

103. A single phase, voltage source, square wave inverter feeds a pure inductive load. The waveform of the current will be

- (a) Sinusoidal
- (b) Rectangular
- (c) Trapezoidal
- (d) Triangular

104. What should be the frequency modulation ratio (m_f) for a 3-phase inverter if the m_f th 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

105. The device used for switching in a switched Mode Power supply is

- (a) Diode
- (b) Thyristor
- (c) GTO
- (d) MOSFET

Directions :

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

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.

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.

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.

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.

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.

112. Statement (I) : As applied to flip flops, asynchronous inputs are overriding inputs.

Statement (II) : Direct inputs of flip flops are effective even in the absence of the control/clock input.

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.

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 behaviour.

Statement (II) : A change in the stored values in memory elements changes the sequential circuit 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.

116. Statement (I) : Branch instructions in a microprocessor are used to change the sequence of program.

Statement (II) : All logical instructions are branch instructions.

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 modulation are similar to AM, FM and PM modulation.

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.

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.

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.

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