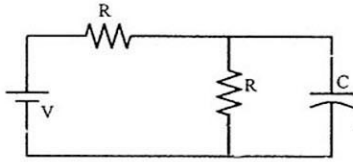


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- Q.1** A circuit consisting of two resistors a capacitor and a battery is shown in the steady state, the voltage across the capacitor would be.



- (a) Zero Volts (b) V volts
(c) Infinite value (d) (V/2) volts
- Q.2** Two ceramic capacitor have the following parameter. One has capacitance C_1 and ceramic thickness d_1 . The other has capacitance C_2 and ceramic thickness d_2 . When the two are connected in series, the series, the combination has a capacitance of
- (a) $C = d_1 + d_2$ (b) $C = d_1 d_2 / (d_1 + d_2)$
(c) $C = C_1 + C_2$ (d) $C = C_1 C_2 / (C_1 + C_2)$
- Q.3** The time rate of change of voltage applied across a $1\mu\text{F}$ capacitor
- (a) $2 \times 10^{-6}\text{A}$ (b) 2 A
(c) $0.5 \times 10^{-6}\text{A}$ (d) 2V
- Q.4** The time rate of change of a current passed through a 1mH inductor is 2mA/s . This means that the voltage across the inductor is
- (a) $0.5 \times 10^{-6}\text{V}$ (b) 0.5V
(c) $2 \times 10^{-6}\text{V}$ (d) 2V
- Q.5** Which of the following statements is true ?
- (a) Silicon doped with either phosphorous only or boron only is p-type semiconductor.
(b) Silicon doped with either phosphorous only or boron only is n-type semiconductor.
(c) Silicon doped with phosphorous is n-type semiconductor.
(d) Silicon doped with boron is n-type semiconductor.
- Q.6** Consider a pn junction diode made of silicon. In this case, which of the following statements is true?
- (a) The value of current depends exponentially on the voltage applied
(b) The value of voltage depends exponentially on the current through the diode
(c) The value of current depends linearly on the voltage applied.
(d) The value of current depends linearly on the current through the diode

- Q.7** A bar of certain material having rectangular cross section is one metre in length and has a cross section of 0.0001 square metres. The value of its longitudinal resistance is 100 ohms. The value of its resistivity would be

(a) 1 ohm metre (b) 0.01 ohm metre
(c) 0.0001 ohm metre (d) 100 ohm metre

- Q.8** Two capacitor of equal value, 1 microfarad, are connected in parallel. The effective capacitance of this combination would be

(a) 2 microfarad (b) 0.5 microfarad
(c) 4 microfarad (d) 0.25 microfarad

- Q.9** A semiconductor is uniformly doped with N_A acceptors and N_D donors. Let the free electron and hole concentrations be n and p respectively. Assume that the semiconductor is at thermal equilibrium and that 100% ionisation has taken place. Then which of the following is true ?

(a) $N_A + N_D = p + n$ (b) $N_A - N_D = n - p$
(c) $N_A N_D = pn$ (d) $N_D - N_A = n - p$

- Q.10** Consider a pn junction in which the p-side. The depletion region would extend

(a) equally on both n- and p-sides.
(b) more towards the p-side and less towards the n-side
(c) more towards the n-side and less towards the p-side.
(d) cannot be predicted.

- Q.11** Which of the following statements is true for bipolar junction transistor ?

(a) Cutoff mode operation if emitter-base junction is forward biased and collector base junctions is forward biased
(b) Cutoff mode operation if emitter-base junction is forward biased and collector base junctions is forward biased and collector base junction is reverse biased.
(c) Cutoff mode operation if emitter-base junctions is reverse biased and collector base junction is forward biased.
(d) Cutoff mode operation if emitter-base junction is reverse biased and collector base junction is reverse biased.

- Q.12** An NPN Bipolar Transistor with a current gain of 100 is biased in saturation mode. If the base current

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is increased by ΔI_b , then

- (a) $\Delta I_c > 100\Delta I_b$ (b) $\Delta I_c = 100\Delta I_b$
 (c) $\Delta I_c < 100\Delta I_b$ (d) $\Delta I_c = 100\Delta I_b$

- Q.13** Let β be the short-circuit common-emitter current gain of a BJT biased in normal active mode. Let I_c be the collector current. Is this β
- (a) a monotonically increasing function of I_c ?
 (b) a monotonically decreasing function of I_c ?
 (c) Initially an increasing function of I_c which reaches a plateau, and then decreases with increasing ?
 (d) Independent of I_c ?

- Q.14** Which of the following statements is true for silicon pn junction solar cell ?
- (a) It can store optical energy
 (b) It can store electrical energy
 (c) It converts electrical energy into optical energy
 (d) It converts optical energy into electrical energy

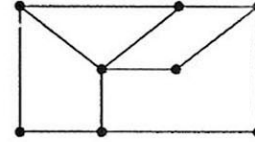
- Q.15** The electron density profile in a semiconductor at equilibrium is such that $n(x_1) = 10n(x_2)$. The hole density profile will be such that
- (a) $p(x_1) = 10p(x_2)$
 (b) $p(x_2) = 10p(x_1)$
 (c) $p(x_1) = 100p(x_2)$
 (d) insufficient information to answer

- Q.16** Which of the following statements is true ? A CMOS inverter is made using
- (a) Two NMOS transistors
 (b) Two PMOS transistors
 (c) One n-channel and one p-channel JFET
 (d) Using one NMOS transistor and one PMOS transistor.

- Q.17** Which of the following statements is true ?
- (a) Thevenin reduction can be used only if there are no current sources.
 (b) In ac circuits, KCL holds only for average currents and not for instantaneous currents.
 (c) Capacitors are generally less lossy than inductor
 (d) Linear networks can have dependent sources.

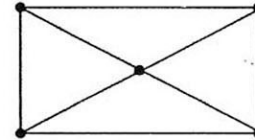
- Q.18** The number of tree branches for a network with

the graph shown in figure.



- (a) depends on the choice of tree
 (b) is less than 8
 (c) is exactly 8
 (d) is exactly 9

- Q.19** Shown alongside is the graph of a network. The number of independent mesh currents that may be assigned in it is



- (a) 4
 (b) 5
 (c) 6
 (d) not fixed : it depends on the actual choice of the meshes

- Q.20** The Fourier Transform
- (a) is a real valued function of a complex argument
 (b) is a complex valued function of a complex argument
 (c) is a real valued function of a real argument
 (d) is a complex valued function of a real argument

- Q.21** An N-channel enhancement mode MOSFET with threshold voltage of 1V is biased at $V_{GS} = 2V$ and $V_{DS} = 2V$. If the drain voltage is doubled to 4V, the drain-to-source current will
- (a) double
 (b) more than double
 (c) increase only slightly
 (d) become half

- Q.22** To double the drain current of an N-channel enhancement mode MOSFET biased in saturation.
- (a) Channel length should be doubled
 (b) Channel width should be halved
 (c) Channel length should be halved
 (d) Oxide thickness should be doubled.

- Q.23** The secondary coil of an ideal 2 : 1 transformer has

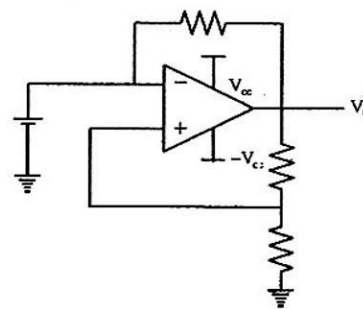
- a 1 Farad capacitor connected across its terminals. The referred impedance on the primary side is of an element
- (a) $L = 4 \text{ H}$ (b) $C = 0.25 \text{ F}$
 (c) $L = 0.25 \text{ H}$ (d) $C = 4 \text{ F}$
- Q.24** A charged capacitor C (charged at V volts) and resistor R are in series with a switch is closed at $t = 0$. Which of the following statements is true ?
- (a) The initial voltage on C is inversely proportional to the charge stored
 (b) The current in the resistor varies as $1/t$ for $t > 0$
 (c) The current for $t > 0$ is independent of the value of C
 (d) The power dissipated by the resistor decreases as time passes
- Q.25** Two incandescent lights of 40 W and 80 W are connected in series
- (a) The current drawn is lesser than what either bulb would draw alone
 (b) The voltage across the 80 W bulb is lesser than that across
 (c) The power dissipated by the 80 W bulb is greater than that by the 40 W bulb
 (d) The current drawn is the average of what of either bulb would draw alone
- Q.26** For a circuit containing linear dependent sources, the following holds in general.
- (a) The superposition theorem cannot be applied
 (b) The solution requires the solving of multiple nonlinear equations
 (c) The Tellegen theorem does not apply
 (d) The superpositions theorem is valid
- Q.27** For a first order RL lowpass network, the following is true:
- (a) The inductor tends to act as a short as $\omega \rightarrow \infty$
 (b) At a very low frequencies, the output voltage lags the input by $\pi/2$
 (c) With its output inloaded, the circuit consumes maximum power at $\omega = 0$
 (d) The inductor's impedance is $\sqrt{2}$ times the resistance at the cutoff frequency
- Q.28** Two capacitors $C_1 = 20 \mu\text{F}$ and $C_2 = 25 \mu\text{F}$ with respective breakdown voltage of $V_1 = 50 \text{ V}$ and $V_2 = 40 \text{ V}$ are given,
- (a) Both capacitors can store the same maximum energy.
- (b) When connected up in series and charged C_1 will fail first.
- (c) Both capacitors can store the same maximum charge.
- (d) When connected up in series and charged, C_2 will fail first.
- Q.29** Two signals $x_1(t)$ and $x_2(t) = -2x_1(-t)$ are applied to the same linear time invariant system. Let the corresponding outputs produced be $y_1(t)$ and $y_2(t)$.
- (a) $y_2(t) = -2y_1(t)$
 (b) $y_2(t) = -2y_1(t)$
 (c) $y_2(t) = -2y_1(-t)$
 (d) $y_2(t)$ may not relate to $y_1(t)$ in any simple manner at all
- Q.30** The Laplace Transform
- (a) of any real signal is always defined on the $j\omega$ axis
 (b) of the impulse response can reveal if the system is stable
 (c) is always complex for every conceivable real signal
 (d) is always finite over the entire s -plane
- Q.31** You are given that $L_1 = 2 \text{ H}$ and $L_2 = 8 \text{ H}$ are perfectly lossless inductors which are magnetically coupled. The coupling inductance M in Henrys will be
- (a) $M = \min(2, 8)$ (b) $M < (2 + 8)/2$
 (c) $M = \sqrt{2 \times 8}$ (d) $M < \sqrt{2 \times 8}$
- Q.32** The roll-off a third filter (in dB/decade) is equal to
- (a) 12 (b) 18
 (c) 60 (d) 36
- Q.33** A spherical hollow metallic sphere has a charge of $+Q$ on it. What is the value of the electric field E inside the sphere?
- (a) Q/ϵ_0 (b) Q/μ_0
 (c) zero (d) Q/ϵ_0
- Q.34** The relationship between electric field strength (\vec{E}) and the potential difference (V) at any point is given by
- (a) $\vec{E} = \nabla a$ (b) $\vec{E} = -\nabla V$
 (c) $v = \nabla \cdot \vec{E}$ (d) $\vec{E} = \nabla \times \nabla V$

- Q.35** The concept of electromagnetic propagation was first introduced by
 (a) Faraday (b) Ampere
 (c) Coulomb (d) Maxwell
- Q.36** If $\vec{A} \cdot \vec{B} = \vec{A} \cdot \vec{C}$ and $\vec{A} \times \vec{B} = \vec{A} \times \vec{C}$, where \vec{A} is not a null vector, then
 (a) $\vec{B} = 0$ (b) $\vec{A} = \vec{C}$
 (c) $\vec{B} = \vec{C}$ (d) $\vec{C} = 0$
- Q.37** The governing equation for steady current density \vec{J} in the absence of non-conservative energy sources is
 (a) $\nabla \cdot \vec{J} = 0$ (b) $\nabla \cdot \vec{J} = -\partial \rho / \partial t$
 (c) $\nabla \times \vec{H} = \vec{J} + \partial \vec{D} / \partial t$ (d) $\vec{J} = 0$
- Q.38** A plane wave with the following instantaneous expression for electric field is $E(z, t) = a_x E_{10} \sin(\omega t - kz) + a_y E_{20} \sin(\omega t - kz + \psi)$
 (a) Linear polarized
 (b) right-hand circular polarized
 (c) left-hand circular polarized
 (d) elliptically polarized
- Q.39** Two identical resistive loads consume W watts each when connected in parallel across an ideal dc current source of I amperes. If, instead, they were connected in series with the same source, their total consumption
 (a) would halve
 (b) would double
 (c) would remain the same
 (d) would increase by a factor of 4
- Q.40** A wattmeter will read zero under the following condition
 (a) The sinusoidal voltage frequency is half the frequency of the sinusoidal current
 (b) The voltage and current are exactly in phase
 (c) The current is dc and the voltage is dc.
 (d) The voltage and current have the same time periods but the voltage is sinusoidal whereas the current is a square wave
- Q.41** On an induction type energy meter, is written "1200 rev/kWh". If it is to be used as an approximate wattmeter that is read off in rpm, a 400-watt load would read as
 (a) 10 rpm (b) 6 rpm
 (c) 8 rpm (d) 24 rpm
- Q.42** We are given a delay line of unknown delay. If a 250kHz sinusoid is applied as input, the output lags the input by $\pi/2$; if a 100kHz sinusoid is applied as input, the output is seen to lead the input phase by $\pi/5$. The delay introduced by the line is
 (a) 1 μ s (b) 11 μ s
 (c) 9 μ s (d) 5 μ s
- Q.43** Magnetic flux density is given by
 (a) $B = \epsilon H$ (b) $B = \mu H$
 (c) $B = \mu E$ (d) $B = \mu D$
- Q.44** The divergence of the magnetic flux density B is given as
 (a) $\nabla \cdot B = 0$ (b) $\nabla \cdot B = D$
 (c) $\nabla \cdot B = \rho / \epsilon$ (d) $\nabla \cdot B = E$
- Q.45** In a three-phase delta-connected balanced load
 (a) line current is equal to the phase current
 (b) line current is three times the phase current
 (c) line current is $\sqrt{3}$ times the phase current
 (d) line current is the sum of the three phase currents
- Q.46** A 440 V 6-pole 50 Hz three-phase induction motor is operating from a 440 V supply and driving a grinding mill, supplying rated HP. The rpm of the motor is approximately equal to
 (a) 960 (b) 1000
 (c) 1440 (d) 1500
- Q.47** For a single phase fully controlled converter bridge operating with continuous load current, the converter will operate in inverting mode for triggering angle, α , such that:
 (a) $0 < \alpha < \pi/2$ (b) $\pi/2 < \alpha < \pi$
 (c) $\pi/4 < \alpha < 3\pi/4$ (d) $\alpha > \pi$
- Q.48** The following is generally true. A series inductor is used to protect the SCR
 (a) against device overvoltage

- (b) against device over current
(c) against forward dv/dt
(d) against di/dt
- Q.49** For a 50 Hz ac input, the ripple frequency in the output that a full-wave rectifier produces is equal to
(a) 25 Hz (b) 50 Hz
(c) 100 Hz (d) 200 Hz
- Q.50** A system is said to be BIBO stable if Bounded Inputs always yield Bounded Output. By this criterion,
(a) an integrator is stable but a differentiator is not
(b) a differentiator is stable but an integrator is not
(c) neither the differentiator or the integrator is stable
(d) both the differentiator and integrator are stable

Paper - II

- Q.51** As compared to a BJT amplifier, an amplifier made using a JFET is likely to have
(a) very high voltage gain
(b) very high bandwidth
(c) very high voltage swing
(d) very high input resistance
- Q.52** The voltage gain of a common emitter amplifier is
(a) directly proportional to collector bias current
(b) inversely proportional to collector bias current
(c) independent of collector bias current
(d) proportional to square of collector bias current
- Q.53** If the emitter bypass capacitor in a common emitter amplifier is removed, then
(a) input resistance will decrease
(b) voltage gain will increase
(c) voltage gain will decrease
(d) voltage gain will remain unaffected
- Q.54** An opamp based inverting amplifier has a gain of -20 and a bandwidth of 50 kHz. If the gain of the amplifier is reduced to -1, its bandwidth will change to
(a) 10 kHz (b) 100 kHz
(c) 1 MHz (d) 10 MHz
- Q.55** Use of a series-shunt negative feedback in an amplifier will
(a) increase input impedance and decrease output impedance
(b) decrease input impedance and decrease output impedance
(c) decrease input impedance and increase output impedance
(d) increase input impedance and increase output impedance
- Q.56** An emitter follower amplifier has
(a) current gain that is always less than 1
(b) voltage gain that is always less than 1
(c) very small input impedance
(d) very large output impedance
- Q.57** A difference amplifier has a differential mode gain of 100 and a common mode rejection ratio of 1000. If the two applied input voltages are v_1 and v_2 , then the output voltage will be
(a) $100(v_1 - v_2) + 0.1 \frac{(v_1 + v_2)}{2}$
(b) $100 \frac{(v_1 + v_2)}{2} + 0.1(v_1 - v_2)$
(c) $100(v_1 - v_2) + 10^5 \frac{(v_1 + v_2)}{2}$
(d) $100 \frac{(v_1 + v_2)}{2} + 100(v_1 - v_2)$
- Q.58** The voltage at the output of the circuit shown below will be
(a) zero (b) $+V_{cc}$
(c) triangular wave (d) square wave

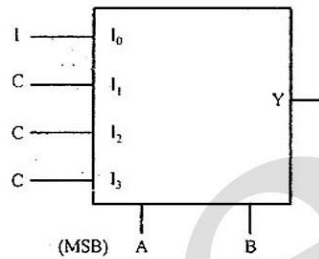


to complete a Karnaugh map

- (b) The information in a Karnaugh map is not sufficient to complete a truth table
- (c) The information in a truth table is sufficient to complete a Karnaugh map
- (d) Truth table has no relationship with its Karnaugh map

- Q.60** For a voltage follower circuit using an op-amp, which of the following is true ?
- (a) both input and output impedance are very large
 - (b) input impedance is very large and the output impedance is very small
 - (c) input impedance is very small and the output impedance is very large
 - (d) both input and output impedance are very small.

- Q.61** Expression for $Y(A, B, C)$ in figure, where $A, B,$ and C are Boolean variables is



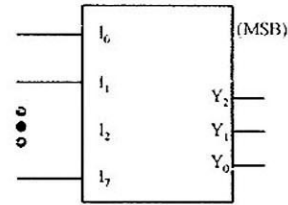
- (a) $\overline{AB} - \overline{ABC}$
- (b) $A + BC$
- (c) $\overline{AB} + \overline{BC}$
- (d) $(AB + A\overline{B})C$

- Q.62** A 10 bit ADC has a range of ± 5 V. The resolution of the ADC is approximately
- (a) 10mV
 - (b) 100mV
 - (c) 0.5 V
 - (d) 1 V

- Q.63** The number of address lines in a 8 bit 4k ROM is
- (a) 8
 - (b) 10
 - (c) 12
 - (d) 16

- Q.64** What is the minimum number of JK flip-flops required to realize a modulo 5 synchronous counter?
- (a) 5
 - (b) 2
 - (c) 4
 - (d) 3

- Q.65** An eight lines to three lines encoder is shown in figure. The output Y_1 is



- (a) $I_1 + I_3 + I_5 + I_7$
- (b) $I_2 + I_3 + I_6 + I_7$
- (c) $I_4 + I_5 + I_6 + I_7$
- (d) $I_1 + I_3 + I_4 + I_7$

- Q.66** Which of the following statements is true ?
- (a) Availability of large numbers of only AND gates is sufficient to realize any combinatorial circuit
 - (b) Availability of large number of only NAND gates is sufficient to realize any combinatorial circuit
 - (c) Availability of large numbers of only OR gates is sufficient to realize any combinatorial circuit
 - (d) Availability of large numbers of only NOT gates is sufficient to realize any combinatorial circuit

- Q.67** The number of different Boolean functions of 4 variables is
- (a) 2^{16}
 - (b) 16^2
 - (c) 4^2
 - (d) 16^4

- Q.68** The use of PI controllers
- (a) reduces oscillations
 - (b) results in zero steady-states error for step input
 - (c) lowers peak overshoot
 - (d) improve relative stability

- Q.69** The open loop transfer function of a system is given by $K1[s(s + 2)(s + 3)]$. For drawing root locus, the point of intersection of the asymptotes with the real axis is
- (a) $-1/3$
 - (b) $-2/3$
 - (c) $-5/3$
 - (d) 0

- Q.70** In feedback control system with $G(s) = 16/[s(s + 4)]$ and $H(s) = 1 + Ks$, the damping ratio of 0.6 will be achieved for K equal to
- (a) 0.1
 - (b) 0.02
 - (c) 0.025
 - (d) 0.05

- Q.71** A single input single output linear time invariant system described by nth order differential equation is adequately described in state space by
- (a) $n + 2$ state equations

- (b) $n + 1$ state equations
- (c) n state equations
- (d) $n - 1$ state equations

- (c) the signals are either orthogonal or antipodal
- (d) abrupt phase discontinuities between consecutive symbols are avoided

Q.72 The polar plot of the open loop transfer function $1/[s(s+2)]$ will encircle the $-1 + j0$ point.
 (a) once (b) twice
 (c) thrice (d) 0 times

Q.78 Hilbert transform of $A \sin(2\pi f_0 t)$ is
 (a) $-A \sin(2\pi f_0 t)$ (b) $A \cos(2\pi f_0 t)$
 (c) $-A \cos(2\pi f_0 t)$ (d) $A \sin(2\pi f_0 t)$

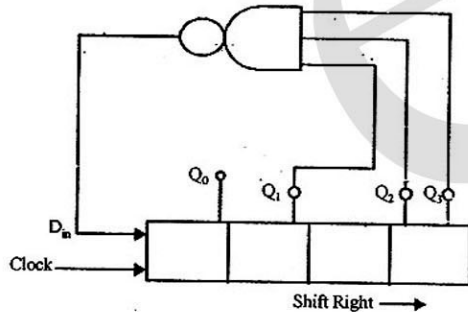
Q.73 A servomotor is mainly used for
 (a) position control
 (b) velocity control
 (c) acceleration control
 (d) both velocity and acceleration control

Q.79 The signalling information in a 30-channel PCM system has a bit rate of
 (a) 2.048 Mbps (b) 64 kbps
 (c) 8 kbps (d) 2 kbps

Q.74 AM broadcast systems use a SW band that extends from
 (a) 30 MHz to 300 MHz
 (b) 30 MHz to 30 MHz
 (c) 540 kHz to 1.6 MHz
 (d) 330 kHz to 960 kHz

Q.80 The modulated carrier average power in an FM system is equal to the
 (a) modulating signal power
 (b) unmodulated carrier power
 (c) difference between modulating signal power and unmodulated carrier power
 (d) sum of the modulated signal power and the unmodulated carrier power

Q.75 The initial state of the shift register in figure is $Q_0 Q_1 Q_2 Q_3 = 1100$. The sequence appearing on Q_0 if a periodic clock is applied is



- (a) 1110001 (b) 100111
- (c) 100110 (d) 110011

Q.81 In a superheterodyne radio receiver, the IF amplifier
 (a) Contributes to the major part of the signal amplification
 (b) improves sensitivity of the receiver
 (c) creates image channel interference
 (d) removes the need for the detector stages

Q.82 A low-pass signal having a bandwidth of 3500 Hz is sampled such that a guard band is available for ease in filtering. The sampling frequency used 7200 Hz. The guard bandwidth is
 (a) 500 Hz (b) 1000 Hz
 (c) 200 Hz (d) 400 Hz

Q.76 The closed loop transfer function of system is given by $G(s) = 1/[s(s+2)(s^2+4)]$. The system is
 (a) completely unstable
 (b) completely stable
 (c) marginally stable
 (d) conditionally stable

Q.83 The output of a system is $y(t) = 3x(t) - x^2(t)$, where $x(t)$ is the input to the system. The system is
 (a) linear and time varying
 (b) non-linear and time varying
 (c) linear and time invariant
 (d) non-linear and time invariant

Q.77 In a QPSK digital signalling scheme,
 (a) 4 data bits are transmitted per channel symbol.
 (b) 4 different carrier frequencies are used.

Q.84 For the modulated carrier in a quadrature amplitude shift keyed (QASK) digital system.
 (a) The transmitted power is independent of data
 (b) Every signal is orthogonal to every other signal

- (c) No signal is orthogonal to any other signal
(d) Some signals are orthogonal to some others
- Q.85** In Indian TV, video signal colour standard used is
(a) VHS (b) SECAM
(c) PAL (d) NTSC
- Q.86** Two random variables U and V are distributed according to $f_{u,v}(u, v) = (C/4)e^{-2u-v}$ (for $u \geq 0, v \geq 0$) and = 0 (otherwise) where C, a constant, is equal to
(a) 8 (b) 2
(c) 4 (d) 1/2
- Q.87** The input to a linear delta modulator is a sinusoidal signal having a peak amplitude of 1 volt. The maximum input signal frequency is 1000 Hz. The input signal is sampled at 8 times the Nyquist rate. The step size for a 800 Hz input, assuming no slope overload, is
(a) $\pi/40$ volts (b) $\pi/8$ volts
(c) $\pi/10$ volts (d) $\pi/4$ volts
- Q.88** A uniform sinusoidal plane wave in air has the following phasor expression for electric field:
 $\vec{E}(x, z) = \vec{a}_y 10e^{j(6x+8z)} \text{ V/m}$
The frequency of operation will be
(a) $4.78 \times 10^8 \text{ Hz}$ (b) $2 \times 10^8 \text{ Hz}$
(c) 10^9 Hz (d) $3.82 \times 10^8 \text{ Hz}$
- Q.89** If a lossless line is terminated with a load impedance $40 + j30 \Omega$, then the characteristic impedance of the line for minimum possible standing wave ratio (SWR) will be
(a) 70Ω (b) 25Ω
(c) 50Ω (d) 100Ω
- Q.90** A standard air-filled rectangular waveguide has dimensions $a = 7.21 \text{ cm}$ and $b = 3.4 \text{ cm}$. The type of mode that can be used to transmit electromagnetic wave with wavelength $\lambda = 10 \text{ cm}$ is
(a) TE_{10} (b) TE_{11}
(c) TE_{20} (d) TM_{11}
- Q.91** An antenna at the earth station of satellite communication link having a gain of 55dB at 14 GHz aimed at a geostationary satellite 36,500 km away. The receiving antenna on the satellite has a gain of 35dB. The earth station transmitted power, for receiving a signal power of $2.1877 \times 10^{-9} \text{ W}$ at the output of the receiving antenna, is
(a) 0.1 kW (b) 0.5 kW
(c) 1 kW (d) 10 kW
- Q.92** A parabolic, dish antenna with an efficiency of 55% and an operating frequency of 10GHz has a gain of 43.825dB. Its diameter is
(a) 1 m (b) 2 m
(c) 4 m (d) 8 m
- Q.93** The binary number 101 represents
(a) -3 in two's complement system
(b) 7 in sign magnitude system
(c) -5 in two's complement system
(d) -2 in sign magnitude system
- Q.94** Microprogramming is a technique commonly used of implement
(a) data path of a processor
(b) cache memory
(c) control unit of a processor
(d) none of the above
- Q.95** In frequency shift keying.
(a) The signalling system is antipodal
(b) The bandwidth requirement is independent of the number of symbols used.
(c) The transmitted power is independent of the symbol transmitted.
(d) The signalling is non-orthogonal.
- Q.96** In a binary PCM system, the maximum tolerable error in sample amplitudes is 0.5% of the peak input signal amplitude. The input signal bandwidth is 5MHz. The minimum rate of transmission of the PCM coded bits is
(a) 70 Mbits/sec (b) 80 Mbits/sec
(c) 90 Mbits/sec (d) 100 Mbits/sec
- Q.97** In 8085 processor has register contents SP = 5FF8H, B = 34H, and C = 7FH before the execution PUSH B. The value of SP = and the content of the Stack Top after the execution of the instruction respectively are
(a) 5FFAH and 7FH (b) 5FF6H and 34H
(c) 5FF6H and 7FH (d) 5FF8H and 34H

- Q.98** Which instruction in an 8085 processor can clear the accumulator
 (a) MOV B, C (b) JNZ 2100H
 (c) STA 2000H (d) XRAA
- Q.99** How many machine cycles will the execution of SIM instruction take in an 8085 processor?
 (a) 1 (b) 4
 (c) 2 (d) 3
- Q.100** Compared to a CISC Processor, a RISC processor has
 (a) reduced Cache memory
 (b) reduced number of interrupts
 (c) less number of instructions
 (d) reduced address lines
- PAPER-III**
- Q.101** Which of the following technologies does NOT contribute to environmental-friendly engines?
 (a) MPFI
 (b) Turbo charging
 (c) Catalytic converters
 (d) Electronic ignition
- Q.102** Who is the author of Future Shock and Third Wave?
 (a) Desmond Morris
 (b) Norman Mailer
 (c) Aldous Huxley
 (d) Alvin Toffler
- Q.102** Ans ()
- Q.103** Who is the author of Wings of Fire?
 (a) C. N. R. Rao (b) Abdul Kalam
 (c) N. Vittal (d) Khuswant Singh
- Q.104** Arrange the following according to the time of introduction of the following technology in large-scale telecommunications:
 1. Fibre Optics
 2. Under Ocean Cables
 3. Satellite Communication
 4. Wireless in Local Loop
 (a) 1, 2, 3, 4 (b) 3, 2, 1, 4
 (c) 2, 3, 1, 4 (d) 3, 2, 4, 1
- Q.105** The suffix in attached to many net addresses refer to which of the following?
 (a) inbox (b) internet
 (c) India (d) input
- Q.106** Technology Next is the slogan of which company?
 (a) Videocon
 (b) Compaq
 (c) Hewlett-Packard
 (d) Phillips
- Q.107** Jonas Salk is famous because of he developed
 (a) Wet photographic process
 (b) Silicon devices
 (c) Viagra
 (d) Polio vaccine
- Q.108** Which of the following is a greenhouse gas?
 (a) Oxygen (b) Nitrous oxide
 (c) Carbon dioxide (d) Nitric oxide
- Q.109** Which of the following is NOT a clean fuel?
 (a) HSD (b) CNG
 (c) LPG (d) LSD
- Q.110** Which American company has produced an insect resistant variety of cotton that has undergone successful trials in India?
 (a) General Cotton (b) Monsanto
 (c) Cargil (d) General Food
- Q.111** About what percentage of Electric power produced in India is thermal?
 (a) 40 (b) 50
 (c) 72 (d) 80
- Q.112** Who is the Chairperson of the United Nations Human Rights Commission?
 (a) Sadaka Ogata
 (b) Megawati Sukanoputri
 (c) V. S. Naipal
 (d) J. N. Bhagawati
- Q.113** The so called Convergence Bill refers to
 (a) Single regulator for rail, road and water transport
 (b) Single regulator for print media, film media and electronic media
 (c) Single regulator for telecom; information technology and broadcasting sectors
 (d) All of the above

- Q.114** Interim Test Range of missiles is located at
(a) Chandipur-on-sea (b) Sriharikota
(c) Bangalore (d) Dehri-on-Sone
- Q.115** The director of the film Monsoon Wedding is
(a) Mira Nair
(b) Shekhar Kapoor
(c) Yash Chopra
(d) Shyam Benegal
- Q.116** Which of the following committees examined and recommended financial sector reforms?
(a) Abid Hussain Committee
(b) Narasimham Committee
(c) Chelliah Committee
(d) Jalan Committee
- Q.117** The theme of the World Development Report 2001 is
(a) Attacking Poverty
(b) Full Employment
(c) Knowledge for Development
(d) The Changing World
- Q.118** Economic liberalisation in India started with
(a) Removing the procedural formalities of Foreign Direct Investment
(b) Significant reduction in tax rates
(c) Convertibility of Indian Rupee
(d) Substantial changes in Industrial licensing policy
- Q.119** In eye donation, which part of the eye is transplanted?
(a) Eye ball (b) Retina
(c) Lens (d) Cornea
- Q.120** Blood of which group can be safely transfused to all persons?
(a) A+ (b) O-
(c) AB- (d) None

EXPLANATIONS

Q.1 Ans. (d)
In the steady state, capacitors will be open-circuited.

$$\text{Therefore, } v_c = \frac{V}{R+R} \times R = \frac{V}{2} \text{ volts}$$

Q.2 Ans. (d)
In parallel connection, $C = C_1 + C_2$

$$\text{In series connections, } C = \frac{C_1 C_2}{C_1 + C_2}$$

Q.3 Ans. (a)

$$i_c = C \frac{dv_c}{dt}$$

$$= 1 \times 10^{-6} \times$$

$$= 2 \times 10^{-6} \text{ A}$$

Q.4 Ans. (c)

$$v_L = L \frac{di_L}{dt}$$

$$= 1 \times 10^{-3} \times 2 \times 10^3$$

$$= 2 \times 10^6 \text{ V}$$

Q.5 Ans. (c)

Q.6 Ans. (a)

$$I = I_0 (e^{V/nV_T} - 1)$$

Q.7 Ans. (b)

$$\rho \frac{RA}{\ell} = \frac{100 \times 0.0001}{1} = 0.01 \Omega - \text{m}$$

Q.8 Ans. (a)

In parallel combination,

$$C = C_1 + C_2$$

$$= 1 + 1$$

$$= 2 \mu\text{F}$$

Q.9 Ans. (d)

Since the semiconductor is electrically neutral, therefore, at thermal equilibrium,

$$N_D + p = N_A + n$$

$$\Rightarrow N_D - N_A = n - p$$

Q.10 Ans. (c)

$$\text{Depletion width} \propto \frac{1}{\text{doping}}$$

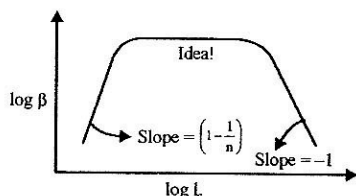
Q.11 Ans. (d)

Q.12 Ans. (c)

In saturation mode,

$$h_{re} I_B \geq I_{CS}$$

Q.13 Ans. (c)



At low injection levels β is degraded by poor emitter injection efficiency. At high currents, β decreases due to excess majority charge in the base.

Q.14 Ans. (d)

Q.15 Ans. (b)

At equilibrium,

$$n_1 p_1 = n_2 p_2$$

Q.16 Ans. (d)

Q.17 Ans. (d)

Superposition theorem is applicable to linear networks which comprise independent sources, linear dependents source and linear passive elements like resistor, inductor, capacitor and transformer.

Q.18 Ans. (b)

Number of tree branches = $n - 1$
where n = number of nodes

Q.19 Ans. (a)

Number of independent mesh currents,

$$I = b - n - 1$$

$$\Rightarrow I = 8 - 5 + 1 = 4$$

Q.20 Ans. (a)

Q.21 Ans. (b)

$$I_D = K(V_{GS} - V_T)^2$$

Q.22 Ans. (c)

Q.23 Ans. (b)

$$Z_s = Z_p \left(\frac{N_s}{N_p} \right)^2$$

$$\frac{1}{C_2 s} = \frac{1}{C_1 s} \left(\frac{1}{2} \right)^2$$

$$\Rightarrow C_1 = \frac{C_2}{4} = \frac{1}{4} = 0.25 \text{ F}$$

Q.24 Ans. (d)

Since the current through the resistor decreases as time passes, therefore, the power dissipated by the resistor decreases. $[P = I^2 R]$.

Q.25 Ans. (c)

Q.26 Ans. (d)

Q.27 Ans. (a)

Q.28 Ans. (c)

$$Q = C_1 V_1 = C_2 V_2$$

Q.29 Ans. (c)

Q.30 Ans. (c)

Q.31 Ans. (d)

$$M = K \sqrt{L_1 L_2}$$

where $0 \leq K \leq 1$ is coupling coefficient.

Q.32 Ans. (c)

Q.33 Ans. (c)

Q.34 Ans. (b)

Q.35 Ans. (d)

Q.36 Ans. (c)

Q.37 Ans. (b)

- Q.38 Ans.(d)
 Q.39 Ans.(d)
 Q.40 Ans.(c)
 Q.41 Ans.(c)

$$\text{Watt-meter reading} = \frac{1200 \times 400}{1000 \times 60} = 8 \text{ rpm}$$

- Q.42 Ans.(c)
 Q.43 Ans.(b)
 Q.44 Ans.(a)
 Q.45 Ans.(c)
 Q.46 Ans.(b)

$$\begin{aligned} \text{motor speed} &= \frac{120f}{P} \\ &= \frac{120 \times 50}{6} \\ &= 1000 \text{ rpm} \end{aligned}$$

- Q.47 Ans.(b)
 Q.48 Ans.(d)
 Q.49 Ans.(c)

The ripple frequency in the output a full-wave rectifier is double to the line frequency.

- Q.50 Ans.(b)
 Q.51 Ans.(d)
 Q.52 Ans.(a)
 Q.53 Ans.(c)
 Q.54 Ans.(c)
 Q.55 Ans.(d)
 Q.56 Ans.(b)
 Q.57 Ans.(a)
 Q.58 Ans.(a)
 Q.59 Ans.(c)
 Q.60 Ans.(b)
 Q.61 Ans.(c)

$$Y = \overline{AB} + \overline{ABC} + ABC$$

or
$$Y = \overline{AB} + BC$$

- Q.62 Ans.(a)

$$\text{Resolution} = \frac{V_{\max} - V_{\min}}{2^n}$$

where = number of bits

$$\begin{aligned} \text{Resolution} &= \frac{5 - (-5)}{2^{10}} \\ &= \frac{10}{1024} \\ &\approx 10 \text{ mV} \end{aligned}$$

- Q.63 Ans.(c)
 Number of address lines
 $= 2 + 10$
 $= 12$

- Q.64 Ans.(d)
 Q.65 Ans.(a)
 Q.66 Ans.(b)

- Q.67 Ans.(a)

Number of Boolean functions

$$= 2^{2^n}$$

where n = number of variables

- Q.68 Ans.(b)

- Q.69 Ans.(c)

$$\text{Centroid} = \frac{-2-3}{3} = \frac{-5}{3}$$

- Q.70 Ans.(d)

$$\begin{aligned} \frac{G(s)}{1+G(s)H(s)} &= \frac{16/s(s+4)}{1 + \frac{16(1+Ks)}{s(s+4)}} \\ &= \frac{16}{s^2 + 4s + 16Ks + 16} \\ &= \frac{16}{s^2 + (16K+4)s + 16} \end{aligned}$$

$$\text{Comparing with } \frac{\omega_n^2}{s^2 + 2\xi\omega_n s + \omega_n^2}$$

$$\omega_n^2 = 16 \Rightarrow \omega_n = 4$$

$$2\xi\omega_n = 16K + 4$$

$$\Rightarrow 2 \times 0.6 \times 4 = 16K + 4$$

$$\Rightarrow K = 0.05$$

- Q.71 Ans.(c)

- Q.72 Ans.(d)

- Q.73 Ans.(a)

- Q.74 Ans.(c)

- Q.75 Ans.(a)

- Q.76 Ans.(c)

Characcteristic equation is $(s+2)(s^2+4)=0$

or $(s+2)(s+2j)(s-2j)=0$

Since the two roots of the characteristic equation lie on $j\omega$ axis, therefore, the system is marginally stable.

- Q.77 Ans.(d)

Abrupt phase discontinuity between consecutive symbols gives amplitude variation in the waveform which cause difficulty in QPSK communication.

- Q.78 Ans.(c)

$$\begin{aligned} m_n(n, t) &= A \sin(2\pi f_0 t - \pi/2) \\ &= -A \cos(2\pi f_0 t) \end{aligned}$$

- Q.79 Ans.(b)

For signalling information = 64 kbps.

- Q.80 Ans.(b)

- Q.81 Ans.(a)

- Q.82 Ans.(c)