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FOR KSET PREPARATION

KSET 2024 Electronic Science Question Paper

EXAM	YEAR	TYPE
KSET	2024	Question Paper

A1

VERSION CODE

ELIGIBILITY/COMPETITIVE EXAM 2024
PAPER-2
Total Number of Questions: 100
Maximum Marks : 200

Serial Number :

MENTION YOUR REGISTER NUMBER

Subject: ELECTRONIC SCIENCE

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DOs:

1. This question booklet is issued to you at **9.55 a.m.** by the room invigilator.
2. Check whether the Register Number has been entered and shaded in the respective circles on the OMR answer sheet.
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1. In case of usage of signs and symbols in the questions, the regular textbook connotation should be considered unless stated otherwise.
2. This question booklet contains **100** questions and each question will have one statement and four different options / responses & out of which you have to choose one correct answer.
3. At **10.00 a.m.** remove the paper seal of this question booklet and check that this booklet does not have any unprinted or torn or missing pages or items etc., if so, get it replaced by a complete test booklet within **5** minutes of the commencement of exam. Read each item and start answering on the OMR answer sheet.
4. Completely **darken / shade** the relevant circle with a **blue or black ink ballpoint pen against the question number on the OMR answer sheet.**

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①	●	③	④	⊗	②	③	④	①	②	③	④	①	●	●	④
				●	②	③	④	①	●	③	④	①	②	③	④

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9. All questions carry equal marks.
10. Use of Mobile Phones, Calculators and other Electronic / Communication gadgets of any kind is prohibited inside the Examination venue.

1. In the constant-current region, how will the I_{DS} change in an n-channel JFET?

(1) As V_{GS} decreases I_D decreases

(2) As V_{GS} increases I_D Increases

(3) As V_{GS} decreases I_D remains constant

(4) As V_{GS} increases I_D remains constant

2. An LED and Phototransistor is equivalent to a/an

(1) Thermocouple (2) FET

(3) Optocoupler (4) Regulator

3. _____ is an equivalent circuit of a diode in which it is represented as a switch in series with a barrier potential.

(1) First Approximation (2) Second Approximation

(3) Third Approximation (4) Fourth Approximation

4. JFET can be operated under

a) Enhancement mode b) Depletion mode

c) Both Enhancement and Depletion mode d) Active mode

Codes:

(1) a, c (2) b

(3) a, b, c (4) c, d

5. Which of the following are TRUE about a Tunnel diode?

a) It uses negative conductance property

b) It operates at high frequency

c) Fermi level of 'P' side becomes higher than 'N' side in forward bias

d) It is a variable capacitance device

(1) a, b (2) a, b, c

(3) b, c (4) d only

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6. Match the following and choose the correct code:

	List-I		List-II
a)	P type semiconductor	i.	Pure semiconductor
b)	Intrinsic semiconductor	ii.	Doped with Impurity
c)	Extrinsic semiconductor	iii.	Majority carriers are Electrons
d)	N-type semiconductor	iv.	Majority carriers are Holes

Codes:

(1) a – iii, b – ii, c – iv, d – i

(2) a – i, b – ii, c – iv, d – iii

(3) a – iv, b – i, c – ii, d – iii

(4) a – ii, b – i, c – iv, d – iii

7. Match the following devices based on their principle of operation and application:

	List-I		List-II
a)		i.	Light into Electricity
b)		ii.	Rectification
c)		iii.	Voltage Regulator
d)		iv.	Electric into Light

Codes:

(1) a – ii, b – iii, c – iv, d – i

(2) a – ii, b – iii, c – i, d – iv

(3) a – i, b – ii, c – iii, d – iv

(4) a – iii, b – ii, c – iv, d – i

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8. Arrange the following materials according to their resistivity in decreasing order

a) Iron b) Tungsten

c) Aluminium d) Copper

Codes:

(1) a, b, c, d (2) d, c, b, a

(3) a, b, d, c (4) a, c, b, d

9. Examine carefully Assertion (A) and Reason (R) and choose the correct answer:

Assertion (A) : CdTe is a material used in photoconducting mode only for infrared detection

Reason (R) : It is very difficult to form a p-n junction using CdTe material

Codes:

(1) Both (A) and (R) are true and (R) is the correct explanation of (A)

(2) Both (A) and (R) are true but (R) is not the correct explanation of (A)

(3) (A) is true but (R) is false

(4) (A) is false but (R) is true

10. Examine carefully Assertion (A) and Reason (R) and choose the correct answer:

Assertion (A) : JFET has very high input impedance

Reason (R) : JFET provides high degree of isolation between Input and Output circuits

Codes:

(1) Both (A) and (R) are true and (R) is the correct explanation of (A)

(2) Both (A) and (R) are true but (R) is not the correct explanation of (A)

(3) (A) is true but (R) is false

(4) (A) is false but (R) is true

11. Etching is used in semiconductor fabrication to

(1) Create a conductive layer

(2) Remove material selectively from the wafer surface

(3) Grow a thin layer of oxide

(4) Create patterns using a mask

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12. Which technique provides high resolution images of surface morphology and topography of thin films?

(1) XRD
(2) EDX
(3) TEM
(4) SEM

13. Which layer of a stick diagram is often indicated using blue colour codes?

(1) Diffusion layer
(2) Metal layer
(3) Polysilicon layer
(4) Substrate layer

14. In the fabrication of NMOS and CMOS transistors, the gate is typically made of _____.

a) Aluminium
b) Polycrystalline silicon
c) Copper
d) Silver

Codes:

(1) Option (b) & (c) only
(2) Option (c) & (d) only
(3) Option (b) only
(4) Option (a), (b) & (d)

15. What does the edge exclusion design rule specify?

a) Minimum distance between components and chip edges
b) Maximum distance between components and chip edges
c) Optimal component alignment
d) Placement of vias near the chip edges

Codes:

(1) Option (b) only
(2) Option (a) & (d) only
(3) Option (c) & (d) only
(4) Option (a) only

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16. Match the following and choose the correct code:

	List – I		List – II
a)	Chemical Vapour Deposition (CVD)	i.	Deposition occurs one atomic layer at a time
b)	Physical Vapour Deposition (PVD)	ii.	Material is heated in a vacuum to create vapour
c)	Atomic Layer Deposition (ALD)	iii.	Ions accelerated towards a target material
d)	Spin Coating	iv.	A liquid solution is dispensed onto a spinning substrate

Codes:

(1) a – iii, b – ii, c – i, d – iv

(2) a – i, b – ii, c – iii, d – iv

(3) a – ii, b – i, c – iv, d – iii

(4) a – i, b – iii, c – ii, d – iv

17. Match the following and choose the correct code:

	List-I		List-II
a)	CMOS	i.	Electron are majority carrier
b)	nMOS	ii.	Both electrons and holes are a carrier
c)	pMOS	iii.	It converts the physical signal into an electrical signal via a charge transfer mechanism
d)	CCD	iv.	N-type substrate is used

Codes:

(1) a – iv, b – iii, c – ii, d – i

(2) a – iii, b – ii, c – iv, d – i

(3) a – ii, b – i, c – iv, d – iii

(4) a – i, b – ii, c – iv, d – iii

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18. Examine carefully Assertion (A) and Reason (R) and choose the correct answer:

Assertion (A): Lithography is a critical step in defining the geometry of components on semiconductor wafers.

Reason (R): Lithography uses masks and photo resist to create patterns that guide subsequent manufacturing steps.

(1) Both (A) and (R) are true but (R) is not the correct explanation of (A)

(2) Both (A) and (R) are true and (R) is the correct explanation of (A)

(3) (A) is true but (R) is not true

(4) (R) is false but (A) is true

19. Examine carefully Assertion (A) and Reason (R) and choose the correct answer:

Assertion (A): VLSI design flow is an algorithm with definite objective. Some of them consists of wire length, minimum area and power optimization.

Reason (R): Analog VLSI circuits are extensively used in applications such as audio and video processing, sensor interfaces.

(1) Both (A) and (R) are true and (R) is the correct reason of (A)

(2) Both (A) and (R) are true but (R) is not the correct reason for (A)

(3) (A) is true but (R) is not true

(4) (A) is not true but (R) is true

20. In VLSI n-MOS process, the thinox mask

(1) Patterns of the ion implantation within the thinox region

(2) Deposited polysilicon all over thinox region

(3) Patterns thinox region to expose silicon where source, drain or gate areas are required

(4) Grows thickox over thinox regions in gate areas.

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21. The number of network equations required to describe the voltages and currents in a network having 8 branches and 5 nodes is _____.

(1) 6 (2) 4

(3) 7 (4) 5

22. When a unit step voltage is applied at t = 0 to a series RL circuit with zero initial conditions, then

(1) It is possible for the current to be oscillatory

(2) The voltage across the resistor at t = 0 is zero

(3) The energy stored in the inductor in the steady-state is zero

(4) The resistance current eventually falls to zero

23. The ABCD parameter condition for which the two-port network is reciprocal is

(1) AC – BC = 1 (2) AD – BC = 1

(3) AC – BA = 1 (4) AB – BC = 1

24. Superposition theorem is NOT applicable for

(1) Linear network (2) Time-invariant network

(3) Non-linear network (4) Linear time invariant network

25. Consider the following expression for the driving point impedance

$$z(s) = \frac{2(s^2+1)(s^2+9)}{s(s^2+4)}$$

a) It represents an LC circuit

b) It represents a RLC circuit

c) It has poles lying on the $j\omega$ axis

d) It has a pole at infinite frequency and a zero at zero frequency

(1) b and d (2) a and c

(3) a and d (4) b and c

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26. The order in which the I/P signal flows through following sub-circuits of PLL is

a) Low-pass filter

b) Amplifier

c) Phase detector

d) VCO

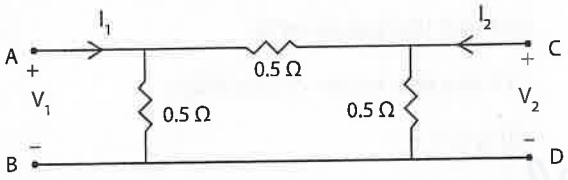
(1) c, a, b, d

(2) b, a, d, c

(3) c, d, a, b

(4) b, c, a, d

27. For the circuit shown in the figure, List-I represents Y-parameters and List-II represents corresponding Y-parameter values. Match List-I with List-II from the following:



List-I		List-II	
a)	y_{11}	i.	4
b)	y_{12}	ii.	– 2
c)	y_{21}	iii.	– 2
d)	y_{22}	iv.	4

(1) a – ii, b – i, c – iii, d – iv

(2) a – i, b – ii, c – iii, d – iv

(3) a – i, b – ii, c – iv, d – iii

(4) a – iv, b – iii, c – ii, d – i

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28. Match the List-I [Time function] with List-II [Laplace transform]:

List-I [Time function]		List-II [Laplace transform]	
a)	1	i.	$\frac{1}{s}$
b)	t	ii.	$\frac{1}{s^2}$
c)	$\sin\omega t$	iii.	$\frac{s}{(s^2+\omega^2)}$
d)	$\cos\omega t$	iv.	$\frac{\omega}{(s^2+\omega^2)}$

(1) a – i, b – ii, c – iii, d – iv

(2) a – ii, b – i, c – iii, d – iv

(3) a – i, b – ii, c – iv, d – iii

(4) a – ii, b – i, c – iv, d – iii

29. Arrange the following design procedures for analog Chebyshev low-pass filter:

a) Find the value of H(s)

b) Find the value of S_k

c) Determine the value of $\in$, μ, a, b

d) Find the order of the filter

(1) d c b a

(2) a b c d

(3) b c a d

(4) c d b a

30. Examine carefully Assertion (A) and Reason (R) and choose the correct answer:

Assertion (A) : Laplace transform is preferred for solving networks involving higher order differential equations

Reason (R): The classical method for solving differential equations of higher order is quite cumbersome

(1) Both (A) and (R) are true and (R) is the correct explanation of (A)

(2) Both (A) and (R) are true, but (R) is not the correct explanation of (A)

(3) (A) is true but (R) is false

(4) (A) is false but (R) is true

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31. The applied input A.C power to a half wave rectifier is 100 watts. The D.C output power obtained is 40 watts. Then the rectification efficiency is _____

(1) 42.3%
(2) 41.25%
(3) 40.00%
(4) 80.15%

32. The Schmitt trigger can be used in which of the following?

i) Square wave generator
ii) Comparator
iii) Astable multivibrator
iv) Triangular wave generator

Codes:

(1) (i), (ii) & (iii)
(2) (ii), (iii) & (iv)
(3) (i), (iii) & (iv)
(4) (i) & (iv)

33. Match the following and choose the correct code:

	List-I		List-II
a)	BJT	i.	Rate of change of output voltage per unit time
b)	Slew rate	ii.	Current controlled device
c)	Phase shift oscillator	iii.	R and C are the frequency determining elements
d)	Differential amplifier	iv.	Used to amplify the difference between two input voltage

Codes:

(1) a – i, b – ii, c – iii, d – iv
(2) a – i, b – iv, c – iii, d – ii
(3) a – ii, b – i, c – iii, d – iv
(4) a – iii, b – ii, c – iv, d – i

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34. Match the following and choose the correct code:

	List-I		List-II
a)	Transistor series voltage regulator	i.	Frequency divider
b)	Schmitt trigger	ii.	As a control element is being fixed in series between V_{in} and V_o
c)	Voltage to frequency converter	iii.	Rectangular wave generator
d)	555 Timer	iv.	An oscillator whose frequency is linearly proportional to a control voltage

Codes:

(1) a – ii, b – iii, c – iv, d – i

(2) a – iii, b – iv, c – ii, d – i

(3) a – iv, b – iii, c – i, d – ii

(4) a – i, b – ii, c – iii, d – iv

35. Examine carefully Assertion (A) and Reason (R) and choose the correct answer:

Assertion (A): In JFET, the drain current I_D rises rapidly with drain source voltage V_{DS} but then becomes constant. At this point the drain source voltage is called pinch-off voltage.

Reason (R): After pinch-off voltage, the channel width becomes so narrow that depletion layer almost touch each other. Therefore increase in drain current is very very small. Hence it remains constant.

Codes:

(1) Both (A) and (R) are true, (R) is the correct explanation of (A)

(2) Both (A) and (R) are true but (R) is not the correct explanation of (A)

(3) (A) is true but (R) is false

(4) (A) is false but (R) is true

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36. Examine carefully Assertion (A) and Reason (R) and choose the correct answer:

Assertion (A): The waveform is shaped by removing a certain portion of the input signal voltage above (or) below a certain level is called Clipping Circuit

Reason (R): The waveform can be shifted in such a way that a particular part of it is maintained at specified voltage level is called Clamping

Codes:

(1) Both (A) and (R) are true, (R) is the correct explanation of (A)

(2) Both (A) and (R) are true but (R) is not the correct explanation of (A)

(3) (A) is true, but (R) is false

(4) (A) is false, but (R) is true

37. Examine carefully Assertion (A) and Reason (R) and choose the correct answer:

Assertion (A): Active filters are generally preferred over passive filters in applications; where precise control over the filter parameters is required

Reason (R): Active filters use OP-amps to provide amplification and shaping of the frequency response.

Codes:

(1) Both (A) and (R) are true, (R) is the correct explanation of (A)

(2) Both (A) and (R) are true, but (R) is not the correct explanation of (A)

(3) (A) is true, but (R) is false

(4) (A) is false, but (R) is true

38. In a CE transistor circuit, which of the following statements is CORRECT?

(1) $I_E = I_c + I_b$

(2) $I_c = I_E + I_b$

(3) $I_b = I_c + I_E$

(4) $I_E = I_c + 2I_b$

39. A Schmitt trigger is a digital circuit that produces

(1) triangular output for sinusoidal input

(2) sinusoidal output for any type of input

(3) trapezoidal output for any type of input

(4) rectangular output for any type of input

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40. The slew rate of an op-amp usually is specified as

(1) V/μ sec

(2) I/μ sec

(3) VI/μ sec

(4) $\frac{\mu}{V}$ sec

41. Simplified expression for the given Boolean expression $f(w, x, y, z) = \Sigma m (1, 5, 6, 7, 11, 12, 13, 15)$ is

(1) $xz + wx\bar{y} + \bar{w}\bar{y}z + \bar{w}xy + wyz + \bar{w}xy$

(2) $wy + wx\bar{y} + \bar{w}\bar{y}z + \bar{w}xy + wyz$

(3) $\bar{w}\bar{y} + wx\bar{y} + \bar{w}\bar{y}z + \bar{w}xy + wyz$

(4) $wx\bar{y} + \bar{w}\bar{y}z + \bar{w}xy + wyz$

42. The characteristic equation of T Flip-Flop is

(1) $Q_{n+1} = \bar{Q}_n T + Q_n \bar{T}$

(2) $Q_{n+1} = \bar{Q}_n \bar{T} + Q_n T$

(3) $Q_{n+1} = Q_n$

(4) $Q_{n+1} = \bar{Q}_n$

43. Which gate can be used as a basic comparator?

(1) NOR

(2) OR

(3) XOR

(4) AND

44. Examine carefully Assertion (A) and Reason (R) and choose the correct answer:

Assertion (A): A truth table can represent the function of any digital circuit.

Reason (R): Truth tables provide all possible input combinations and their corresponding outputs.

(1) Both (A) and (R) are true, (R) is the correct explanation of (A)

(2) Both (A) and (R) are true, (R) is not the correct explanation of (A)

(3) (A) is true, but (R) is false

(4) (A) is false, but (R) is true

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45. Examine carefully Assertion (A) and Reason (R) and choose the correct answer:

Assertion (A): A DeMux cannot be used as a decoder.

Reason (R): A DeMux is built using AND gates only.

(1) Both (A) and (R) are true, (R) is the correct explanation of (A)

(2) Both (A) and (R) are true, (R) is not the correct explanation of (A)

(3) (A) is true, but (R) is false

(4) (A) is false, but (R) is true

46. Match the following List-I with List-II and choose the correct code:

	List-I		List-II
a)	Combinational Circuit	i.	XOR
b)	Distributor	ii.	Priority Encoder
c)	Parity Generator	iii.	Demultiplexer
d)	Arbitration	iv.	Adder

(1) a – i, b – ii, c – iii, d – iv

(2) a – iv, b – iii, c – i, d – ii

(3) a – iv, b – iii, c – ii, d – i

(4) a – i, b – iii, c – ii, d – iv

47. Match the following List-I with List-II and choose the correct code:

	List-I		List-II
a)	Twisted ring-counter	i.	Synchronous counter
b)	Shift register	ii.	Asynchronous counter
c)	Hybrid counter	iii.	FILO
d)	Ripple counter	iv.	Johnson counter

(1) a – i, b – ii, c – iii, d – iv

(2) a – iv, b – iii, c – ii, d – i

(3) a – ii, b – iii, c – iv, d – i

(4) a – iv, b – iii, c – i, d – ii

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48. The correct sequence of these logic families in the decreasing order of their propagation delay in nano seconds is

(1) TTL, DTL, MOS, ECL

(2) DTL, MOS, TTL, ECL

(3) TTL, MOS, ECL, DTL

(4) MOS, DTL, TTL, ECL

49. A positive-going pulse is applied to an inverter. The time interval from the leading edge of the input to the leading edge of the output is 7ns. This parameter is

(1) Speed-power product

(2) Propagation delay t_{PHL}

(3) Propagation delay t_{PLH}

(4) Pulse width

50. Which of the following can be used implementing sequential logic?

i) State machines

ii) Flip-Flops

iii) Multiplexers

iv) Latches

(1) i, iii, iv

(2) i, ii, iv

(3) i, ii

(4) ii, iv

51. In the 8051 microcontroller, the following Register/s are classified as Special Function Registers:

a) Register 0

b) Port 0

c) Accumulator

d) B Register

Codes:

(1) a b c d

(2) b c d

(3) b c

(4) b

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52. In the 8051 microcontroller, the following bits are used for Bank Switching:

a) RS0 b) RS1

c) RS2 d) OV

(1) a b c d (2) a b c

(3) a b (4) b c

53. With reference to the 8051 microcontroller,

Match List-I with List-II based on the type of instruction:

	List-I		List-II
a)	MOV A, R2	i.	Arithmetic
b)	ADD A, #45H	ii.	Branch
c)	CPL A	iii.	Data Transfer
d)	JC	iv.	Logical

Codes:

(1) a – iii, b – i, c – ii, d – iv (2) a – iii, b – iv, c – i, d – ii

(3) a – iii, b – i, c – iv, d – ii (4) a – iii, b – ii, c – i, d – iv

54. With reference to the 8086 microprocessor, match List-I with List-II based on given register operation:

	List-I		List-II
a)	SP	i.	Source pointer
b)	BP	ii.	Top of stack
c)	SI	iii.	Destination pointer
d)	DI	iv.	Base address

Codes:

(1) a – ii, b – iii, c – iv, d – i (2) a – ii, b – iv, c – i, d – iii

(3) a – iv, b – iii, c – ii, d – i (4) a – i, b – iv, c – ii, d – iii

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55. Arrange the following in the order of Standard Assembly Language Syntax:

a) Opcode b) Label

c) Comment d) Operand

Codes:

(1) b c d a (2) b a d c

(3) c d a b (4) c a b d

56. Examine carefully Assertion (A) and Reason (R) and choose the correct answer:

Assertion (A): Microcontrollers consume low power.

Reason (R): All microcontrollers make use of standalone battery power only for their operation.

Codes:

(1) Both (A) and (R) are true and (R) is the correct explanation of (A)

(2) Both (A) and (R) are true, but (R) is not the correct explanation of (A)

(3) (A) is true, but (R) is false

(4) (A) is false, but (R) is true

57. Examine carefully Assertion (A) and Reason (R) and choose the correct answer:

Assertion (A): The 8051 microcontroller has two 16-bit Timers

Reason (R): 8051 Timer's have five modes of operation

Codes:

(1) Both (A) and (R) are true and (R) is the correct explanation of (A)

(2) Both (A) and (R) are true, but (R) is not the correct explanation of (A)

(3) (A) is true, but (R) is false

(4) (A) is false, but (R) is true

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58. The physical address of the data in look-up table is found by XLAT instruction by adding in which of the following contents?

(1) DS, AX and BX registers

(2) AX and BX registers

(3) DS, AL and BX registers

(4) AL and BX registers

59. An instruction pointer (IP) of the 8086 microprocessor is used to store:

(1) Offset address of next data to be fetched from data segment memory

(2) Offset address of next instruction to be fetched

(3) Offset address of next data to be fetched from stack memory

(4) Offset address of next data to be fetched from extra segment memory

60. In the 8051 microcontroller, higher order address BUS (A8-A15) is multiplexed with the I/O lines in _____

(1) Port 1

(2) Port 2

(3) Port 0

(4) Port 3

61. In free space,

$\vec{E}(z, t) = 10^3 \sin(\omega t - \beta z)\, \hat{a}_y$ (v/m) deduce $\vec{H}(z, t)$

(1) $\frac{-10^3}{120\pi} \sin(\omega t + \beta z)\, \hat{a}_x$ (A/m)

(2) $\frac{-10^3}{120\pi} \sin(\omega t - \beta z)\, \hat{a}_x$ (A/m)

(3) $\frac{-10^3}{120\pi} \sin(\omega t - \beta z)\, \hat{a}_y$ (A/m)

(4) $\frac{-10^3}{120\pi} \sin(\omega t + \beta z)\, \hat{a}_y$ (A/m)

62. A transmission line is feeding 1 watt of power to a horn antenna having a gain of 10 dB. The antenna is matched to the transmission line. The total power radiated by the horn antenna into free space is

(1) 10 watts

(2) 1 watt

(3) 0.01 watt

(4) 0.1 watt

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63. Given,

$\vec{A} = 2\hat{a}_x - \hat{a}_z$

$\vec{B} = 3\hat{a}_x + \hat{a}_y$

$\vec{C} = -2\hat{a}_x + 6\hat{a}_y - 4\hat{a}_z$

$\vec{D} = \hat{a}_x + \hat{a}_y + \hat{a}_z$

a) $\vec{A}$ is perpendicular to both $\vec{C}$ and $\vec{D}$

b) $\vec{B}$ is perpendicular to both $\vec{C}$ and $\vec{A}$

c) $\vec{C}$ is perpendicular to both $\vec{A}$ and $\vec{B}$

d) $\vec{C}$ is perpendicular to both $\vec{B}$ and $\vec{D}$

Which one of the above statements are TRUE?

(1) a and b

(2) c and d

(3) b and d

(4) a and c

64. Consider the following statements:

For a uniform plane EM wave,

a) The direction of energy flow is the same as the direction of the propagation of the wave.

b) Electric and magnetic fields are in time quadrature.

c) Electric and magnetic fields are in space quadrature.

Which one of the above statements is/are correct?

(1) b alone is correct

(2) a and b are correct

(3) a and c are correct

(4) c alone is correct

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65. List-II gives mathematical expression for the variables given in List-I. Match List-I with List-II and select the correct answer:

	List-I		List-II
a)	Intrinsic impedance	i.	$\frac{1}{\sqrt{\mu \in}}$
b)	Velocity of wave propagation	ii.	$\sqrt{\frac{\mu}{\in}}$
c)	Skin depth	iii.	$\frac{1}{\sqrt{\pi f \mu \sigma}}$
d)	Attenuation constant	iv.	$\sqrt{\frac{\omega \mu \sigma}{2}}$

(1) a – i, b – ii, c – iii, d – iv
(2) a – ii, b – i, c – iv, d – iii
(3) a – ii, b – i, c – iii, d – iv
(4) a – i, b – ii, c – iv, d – iii

66. List-II gives mathematical expression for the variables given in List-I. Match List-I with List-II and select the correct answer

	List - I (Medium)		List - II (intrinsic impedance for plane wave propagation)
a)	Low level dielectric	i.	$\sqrt{\frac{jw\mu}{\sigma + jw \in}}$
b)	Good conductor	ii.	$\sqrt{\frac{\mu}{\in}}\left(1 + j\frac{\sigma}{2w \in}\right)$
c)	Poor conductor	iii.	$\sqrt{\frac{\mu}{\in}}$
d)	Lossy	iv.	$(1+j)\sqrt{\frac{w\mu}{2\sigma}}$

(1) a – iv, b – iii, c – ii, d – i
(2) a – iv, b – iii, c – i, d – ii
(3) a – iii, b – iv, c – ii, d – i
(4) a – iii, b – iv, c – i, d – ii

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67. Following are the different types of rectangular waveguides and their internal dimension

a) WR-2300 (23 inch × 11.5 inch)

b) WR-2100 (21 inch × 10.5 inch)

c) WR-1800 (18 inch × 9 inch)

d) WR-1500 (15 inch × 7.5 inch)

Arrange them in the increasing order of cutoff frequency of the dominant mode.

(1) a, b, c, d

(2) d, c, b, a

(3) a, b, d, c

(4) c, d, a, b

68. Examine carefully Assertion (A) and Reason (R) and choose the correct answer:

Assertion (A): An isotropic antenna is a fictitious radiator

Reason (R): A Hertzian dipole has an omnidirectional radiation pattern

(1) (A) and (R) are true, (R) is a correct explanation of (A)

(2) (A) and (R) are true, (R) is not a correct explanation of (A)

(3) (A) is true, but (R) is false

(4) (A) is false, but (R) is true

69. Examine carefully Assertion (A) and Reason (R) and choose the correct answer:

Assertion (A): Klystrons are often used in high-power microwave application.

Reason (R): Klystrons can amplify microwave signals with high efficiency and power, making them suitable for radar applications.

Codes:

(1) Both (A) and (R) are true and (R) is the correct explanation of (A)

(2) Both (A) and (R) are true, but (R) is not the correct explanation of (A)

(3) (A) is true, but (R) is false

(4) (A) is false, but (R) is true

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70. An important impairment to digital signals in a communication system is the irregularities in timing caused by imperfection in clock extractions and waveform regeneration. This effect is known as

(1) Jitter
(2) Aliasing
(3) Fading
(4) Attenuation

71. In a PCM system, if number of quantisation levels are 16 and maximum signal frequency is 4KHz, then bit transmission rate is

(1) 64 Kbits/sec
(2) 16 Kbits/sec
(3) 32 Kbits/sec
(4) 64 Kbits/sec

72. What are the key components of a superheterodyne receiver?

a) Mixer
b) Local Oscillator
c) Antenna
d) Demodulator
e) Filter

Codes:

(1) a and b
(2) b and c
(3) c and d
(4) d and e

73. For the statements below,

a) The number of phase shifts in case of BPSK is 2; QPSK is 4 and 8QPSK is 8
b) BPSK has the highest spectral efficiency when compared to QPSK, 0QPSK and 8QPSK
c) 8QPSK transmits the highest bits/symbol when compared to BPSK, QPSK and 0QPSK
d) 0QPSK uses a phase shift of 180° between adjacent symbol to minimize phase transitions

Choose the correct answer:

(1) a and b are true
(2) b and c are true
(3) a and c are true
(4) c and d are true

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74. Match the following:

	List-I (Types of multiplexing)		List-II (Applications)
a)	FDM	i.	Broadband internet Digital Television
b)	TDM	ii.	AM/FM Radio Broadcasting
c)	WDM	iii.	Long distance optical fiber communication
d)	OFDM	iv.	T1/E1 Telecommunication lines

(1) a – i, b – ii, c – iii, d – iv

(2) a – ii, b – iv, c – iii, d – i

(3) a – ii, b – i, c – iii, d – iv

(4) a – iv, b – iii, c – ii, d – i

75. Match the following:

	List - I		List -II
a)	AM	i.	Modulation technique with the widest bandwidth among the four
b)	DSBSC	ii.	Modulation technique with the best power efficiency
c)	SSB	iii.	Modulation technique with the highest power consumption
d)	VSB	iv.	Modulation technique that in more bandwidth efficient than AM and DSBSC

Codes:

(1) a – i, b – ii, c – iv, d – iii

(2) a – ii, b – i, c – iv, d – iii

(3) a – iii, b – ii, c – i, d – iv

(4) a – iii, b – i, c – ii, d – iv

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76. The following are the different types of dispersion observed in case of optical fibre

a) Modal dispersion
b) Waveguide dispersion
c) Chromatic dispersion
d) Material dispersion

Arrange them in the increasing order of severity for high speed data transmission over long distance

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

77. Examine carefully Assertion (A) and Reason (R) and choose the correct answer:

Assertion (A): The entropy of a probability distribution represents the exact amount of information required to describe the events from that distribution.

Reason (R): Entropy is a measure of uncertainty or randomness associated with a probability distribution.

Codes:

(1) Both (A) and (R) are true and (R) is the correct explanation of (A)

(2) Both (A) and (R) are true, but (R) is not the correct explanation of (A)

(3) (A) is true, but (R) is false

(4) (A) is false, but (R) is true

78. Examine carefully Assertion (A) and Reason (R) and choose the correct answer:

Assertion (A): LEDs are commonly used as optical source in short distance communication systems.

Reason (R): LEDs have wider emission spectrum compared to LASERS.

(1) Both (A) and (R) are true and (R) is the correct explanation of (A)

(2) Both (A) and (R) are true, but (R) is not the correct explanation of (A)

(3) (A) is true, but (R) is false

(4) (A) is false, but (R) is true

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79. In a block diagram reduction technique, what does the "Summing point" represent?

(1) A point where output is compared with input.

(2) A point where two or more signals are multiplied

(3) A junction where signals are added or subtracted

(4) A junction where signals are divided

80. Examine carefully Assertion (A) and Reason (R) and choose the correct answer:

Assertion (A): DIAC is used as a triggering device for TRIAC.

Reason (R): While SCR responds to other triggering devices, TRIAC can only be triggered by DIAC.

(1) Both (A) and (R) are true and (R) is the correct explanation of (A)

(2) Both (A) and (R) are true but (R) is not the correct explanation of (A)

(3) (A) is true, but (R) is false

(4) (A) is false, but (R) is true

81. The integral component in a PI controller helps in

(1) Reducing overshoot

(2) Improving transient response

(3) Eliminating steady-state errors

(4) Enhancing system stability

82. An ON-OFF controller is commonly used in which type of application?

(1) Temperature regulation in a greenhouse

(2) Autonomous vehicle navigation

(3) High-precision matching operation

(4) Audio-volume control

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83. Match the PID control term with its role in error correction

	List-I (PID control term)		List-II (Role in error correction)
a)	Proportional	i.	Corrects cumulative error overtime
b)	Integral	ii.	Provides immediate action for sudden changes in error
c)	Derivative	iii.	Adjusts control effort based on current error magnitude

Codes:

(1) a – iii, b – i, c – ii

(2) a – ii, b – iii, c – i

(3) a – i, b –ii, c – iii

(4) a – ii, b – i, c – iii

84. Which of the following statements is TRUE about open-loop control system?

(1) They are highly immune to disturbances

(2) They do not require a controller

(3) They are less accurate due to lack of feedback

(4) They are more complex than closed-loop systems

85. In a closed-loop control system, what is the primary advantage of using negative feedback?

(1) Increases sensitivity to disturbances

(2) Reduces stability

(3) Improves system accuracy and stability

(4) Increases control action

86. Which of the following control systems in typically self-regulating and can adjust its parameters based on changing conditions?

(1) Open-loop control system

(2) Closed-loop control system

(3) Manual control system

(4) Adaptive control system

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87. Match the following List-I with typical devices used in power circuits given in List-II

	List-I		List-II
a)	UJT	i.	BT 136
b)	Power Transistor	ii.	2N2646
c)	SCR	iii.	2N3055
d)	TRIAC	iv.	TN1215

Codes:

(1) a – ii, b – iii, c – iv, d – i

(2) a – iii, b – ii, c – i, d – iv

(3) a – iii, b – iv, c – i, d – ii

(4) a – ii, b – iv, c – i, d – iii

88. Examine carefully Assertion (A) and Reason (R) and choose the correct answer:

Assertion (A): IOT enabled supply chain management, enhances transparency and efficiency.

Reason (R): Real-time tracking of goods and shipments using IOT sensors enables businesses to monitor inventory, predict delays and streamline logistics.

(1) Both (A) and (R) are true and (R) is the correct explanation of (A)

(2) Both (A) and (R) are true but (R) is not the correct explanation of (A)

(3) (A) is true, but (R) is false

(4) (A) is false, but (R) is true

89. A photovoltaic cell, also known as a solar cell, is a type of transducer used to convert:

(1) Mechanical vibrations into electrical voltage

(2) Light intensity variations into electrical energy

(3) Temperature changes into electrical resistance

(4) Chemical concentrations into electrical signals

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90. What is the correct sequence of steps for measuring pH using a pH sensitive electrode and pH meter?

i) Calibrate the pH meter using standard buffer solutions

ii) Immerse the pH sensitive electrode in the solution to be tested

iii) Measure the voltage output of pH-sensitive electrode

iv) Convert the voltage output to pH using the calibration curve

(1) ii, i, iii, iv
(2) i, ii, iii, iv
(3) iii, i, ii, iv
(4) iv, iii, i, ii

91. Examine carefully Assertion (A) and Reason (R) and choose the correct answer:

Assertion (A): DSOs can capture and store waveforms for later analysis.

Reason (R): DSOs use digital memory to store waveform data, allowing for in-depth analysis and measurements after the event has occurred.

(1) Both (A) and (R) are true and (R) is the correct explanation of (A)

(2) Both (A) and (R) are true but (R) is not the correct explanation of (A)

(3) (A) is true but (R) is false

(4) (A) is false but (R) is true

92. Which is the main technical advantage of digital multimeter over an analog multimeter?

(1) High accuracy
(2) Smaller size
(3) Cheaper in cost
(4) More durable

93. A capacitive humidity transducer's output is influenced by :

(1) Temperature and humidity
(2) Humidity and resistance
(3) Temperature and current
(4) Humidity and current

94. EEG electrode is used to measure:

(1) Heart rate
(2) Muscle contractions
(3) Brain activity
(4) Blood pressure

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95. Arrange the following in increasing order of the highest skin contact resistances to lowest skin contact resistances when using ECG, EEG and EMG electrodes:

(1) EMG, ECG, EEG

(2) EMG, EEG, ECG

(3) EEG, EMG, ECG

(4) EEG, ECG, EMG

★ Based on the following paragraph, answer the question (96-100):

A Radio Detection and Ranging (RADAR) system works on the principle of sending out a pulse of electromagnetic radiation and measuring the time it takes for the pulse to return after reflecting off an object. They play a crucial role in various applications, including aviation, weather monitoring, defense navigation and more. RADAR systems use a range of frequencies depending on their application. Microwave frequencies, typically in the X-Band (8-12 GHz) and S-band (2-4 GHz) are commonly used. High power radars can provide greater detection range and improved performance under adverse conditions. The received power depends on the transmitted power, the distance to the target and other factors. The Range Equation is a fundamental equation in radar systems that relates to the range of various parameters (like power transmitted, antenna gain, RADAR cross-section of target and received power).

96. What parameter depends on the range it takes for a radar pulse to travel to a target and return?

(1) Transmitted power

(2) Antenna gain

(3) Received power

(4) Time

97. RADAR cross-section (RCS) refers to

(1) Area of the radar antenna

(2) Measure of radar's signal strength

(3) Measure of a target's reflectivity to radar waves

(4) Range covered by a RADAR system

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98. The RCS of a target affects its detectability by

(1) Increasing the radar's power output
(2) Decreasing the radar's sensitivity
(3) Influencing the target's colour
(4) Affecting the strength of radar echoes

99. Which radar frequency band is commonly used in speed enforcement and collision avoidance systems?

(1) X-Band
(2) S-Band
(3) C-Band
(4) L-Band

100. Which of the following materials is commonly used to reduce RCS in stealth aircraft?

(1) Aluminium
(2) Copper
(3) Carbon fiber composites
(4) Brass

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