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Test Booklet No.

Time : 1 ¹/₄ hours]

PAPER-II

ELECTRONIC SCIENCE

[Maximum Marks : **100**

Number of Pages in this Booklet : **8**	Number of Questions in this Booklet : **50**

J-88-10

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P.T.O.

ELECTRONIC SCIENCE
Paper – II

Note : This paper contains **fifty (50)** objective type questions, each question carrying **two (2)** marks. Attempt **all** the questions.

1. In a degenerate n-type semiconductor the fermilevel lies
   (A) within the conduction band
   (B) below the conduction band
   (C) within the valance band
   (D) above the valance band

2. The threshold voltage of enhancement mode MOSFET can be adjusted by adjusting the
   (A) channel doping
   (B) channel length
   (C) source doping
   (D) drain doping

3. The Laplace transform e^{-at} is
   (A) $\dfrac{1}{s+a}$ (B) $\dfrac{1}{s-a}$
   (C) $(s+a)$ (D) $(s-a)$

4. Norton theorem deals with the equivalent
   (A) voltage source
   (B) power source
   (C) current source
   (D) light source

5. In a PLL, lock occurs when the
   (A) input frequency and the VCO frequency are the same
   (B) phase error is 180°
   (C) VCO frequency is double the input frequency
   (D) phase error is 90°

6. CMRR (Common Mode Rejection Ratio) for a differential amplifier should be
   (A) zero   (B) unity
   (C) small   (D) large

7. Sequential circuits are essentially
   (A) Asynchronous circuits
   (B) Astable multivibrators
   (C) Schmitt trigger
   (D) Synchronous circuits

8. Multiplexers are also used to realize
   (A) Input function to amplifier
   (B) Boolean function
   (C) Up-down counter
   (D) Memories

9. Which instruction of 8086 will <u>not</u> execute ?
   (A) MOV DS, 1234 H
   (B) MOV SP, 1234 H
   (C) MOV AX, 1234 H
   (D) MOV SI, 1234 H

10. The HL pair of 8085 microprocessor is loaded with 0505 H. The HL pair is decremented to 000H. Which flag will be affected ?
    (A) Z flag
    (B) C flag
    (C) No flag is affected
    (D) P flag

11. What places limit on the largest and the smallest integer values in a program ?
    (A) Language used
    (B) Compiler
    (C) CPU
    (D) Size of the operator

12. Which is <u>not</u> an infinite loop ?
    (A) for (;   ;)
    (B) while (1)
    (C) loop; $x = x - -$; go to loop;
    (D) while (0)

13. The complex poynting vector can be defined as
    (A) $\dfrac{1}{2}(\vec{E} \times \vec{H}*)$ (B) $\dfrac{1}{2}(\vec{E} \times \vec{H})$
    (C) $(\vec{E}* \times \vec{H})$ (D) $(E \times H*)$

14. The intrinsic impedance of free space can be defined by
    (A) $\sqrt{\dfrac{\mu_0}{\epsilon_0}}$ (B) $\dfrac{\mu_0}{\sqrt{\epsilon_0}}$
    (C) $\dfrac{\sqrt{\mu_0}}{\epsilon_0}$ (D) $\dfrac{\mu_0}{\epsilon_0}$

15. The value of numerical aperture in fiber optic communication system is equal to
(A) zero   (B) > 1
(C) < 1 (D) 1

16. Which of the following produces amplitude and phase modulation both ?
(A) PSK   (B) QPSK
(C) FSK   (D) QAM

17. Which of the following transducer has the largest linearity ?
(A) RTD
(B) Thermistor
(C) IC sensor
(D) Thermo couple

18. In negative feed back control system, the output amplitude is _____ than in open loop control system.
(A) always reduced
(B) always increased
(C) never reduced
(D) never increased

19. Which of the following physical parameter can be measured by LVDT ?
(A) Displacement
(B) Velocity
(C) Acceleration
(D) Pressure

20. The transfer function of a control system is applicable to which of the following ?
(A) Linear and time-invariant systems
(B) Linear and time-variant systems
(C) Non-linear and time-variant systems
(D) Non-linear and time-invariant systems

Directions : Q. Nos. **21** to **30** : The following items consist of two statements, one labelled the "Assertion (A)" and the other labelled the "Reason (R)". You are to examine these two statements carefully and decide if the Assertion (A) and the Reason (R) are individually true and if so, whether the Reason is a correct explanation of the Assertion. Select your answers to these items using the codes given below and mark your answer accordingly.

Codes :
(A) Both (A) and (R) are true and (R) is the correct explanation of (A).
(B) Both (A) and (R) are true, but (R) is <u>not</u> correct explanation of (A).
(C) (A) is true, but (R) is false.
(D) (A) is false, but (R) is true.

21. **Assertion (A) :** JFET is used in automatic gain control circuits.
Reason (R) : Its variable voltage register property helps gain control.

22. **Assertion (A) :** Superposition theorem can be used to determine the output of a full-wave rectifier whose inputs are sinusoidal signal sources of different frequencies connected in series.
Reason (R) : Superposition theorem holds good for all linear systems.

23. **Assertion (A) :** Operational amplifiers have a high slew rate for good transient response.
Reason (R) : Slew rate is the maximum rate of change of the output voltage of the operational amplifier when a large amplitude step is applied to its input.

24. Assertion (A) : NAND gate is a universal building block.

Reason (R)   : De Morgan's theorem provides inter conversion of gates.

25. Assertion (A) : 8051 is a Boolean processor.

Reason (R)   : There are no bit manipulation instructions in 8051.

26. Assertion (A) : 'C' statement is; int value = 55.

Reason (R)   : The value 55 is assigned to variable value.

27. Assertion (A) : Radio and television receivers are generally of the superheterodyne type.

Reason (R)   : Wireless communication is possible by receiving signals through super heterodype receivers.

28. Assertion (A) : IR lasers are used for long haul transmission operating around at 193 THz.

Reason (R)   : The line width of the semiconductor lasers are of the order of fraction of nm.

29. Assertion (A) : Thyristors are preferred to power diodes in variable power rectifiers.

Reason (R)   : Thyristors provide controlled rectification and also the power loss in them is less compared to that in power diodes.

30. Assertion (A) : The transient performance of a feedback control system is normally analysed by using a unit-step function as the reference input.

Reason (R)   : Unit step function is the most common input found in practice.

31. What is the correct sequence of the following step in the fabrication step of a monolithic, bipolar junction transistor ?
1.   Emitter diffusion
2.   Base diffusion
3.   Buried layer formation
4.   Epi-layer formation
Select the correct sequence using the codes given below :
Codes :
(A)   3, 4, 1, 2   (B)   4, 3, 1, 2
(C)   3, 4, 2, 1   (D)   4, 3, 2, 1

32. The following logic families are written
1.   TTL   2.   DTL
3.   CMOS   4.   ECL
The order in which the propagation delay increases is
(A)   4, 1, 3, 2   (B)   4, 1, 2, 3
(C)   1, 2, 4, 3   (D)   3, 2, 4, 1

33. Given below is a list of transducers :
1.   RTD
2.   Thermocouple
3.   IC sensor
4.   Thermistor
The order in which the temperature range sensed increases
(A)   1, 2, 3, 4   (B)   4, 1, 3, 2
(C)   2, 4, 3, 1   (D)   3, 4, 1, 2

34. Following are the frequency bands :
1.   e   2. x
3.   k   4.   ku
Arrange them in increasing frequency order :
(A)   2, 1, 3, 4   (B)   1, 3, 4, 2
(C)   1, 2, 3, 4   (D)   4, 2, 3, 1

35. For a closed loop system, the roots of the characteristic equation yields
1.   Negative real repetitive roots in critically damped case.
2.   Positive roots in negatively damped case and response diverges out.
3.   Real negative roots in over damped case.
4.   Sustained oscillations.
Select the correct sequence which takes the system from stable to unstable state, using the codes given below :
(A)   1, 3, 4, 2   (B)   2, 4, 3, 1
(C)   3, 2, 4, 1   (D)   4, 1, 3, 2

Directions : Q. Nos. **36** to **45** :

In the following question, match List–I and List–II and select the correct answer using the codes given below the Lists.

36.

	List – I		List – II
(a)	p-n junction diode	(i)	Reference voltage
(b)	Zener diode	(ii)	Pinch-off
(c)	MOSFET	(iii)	Negative resistance
(d)	Tunnel diode	(iv)	Diffusion

Codes :

	(a)	(b)	(c)	(d)
(A)	(iv)	(i)	(ii)	(iii)
(B)	(i)	(ii)	(iii)	(iv)
(C)	(iii)	(iv)	(ii)	(i)
(D)	(iv)	(iii)	(i)	(ii)

37.

	List – I		List – II
(a)	Laplace	(i)	Voltage sources
(b)	Poles on imaginary axis	(ii)	Frequency response
(c)	Thevenin's Theorem	(iii)	Oscillatory
(d)	Bode plots	(iv)	Transient analysis

Codes :

	(a)	(b)	(c)	(d)
(A)	(ii)	(iii)	(i)	(iv)
(B)	(iii)	(i)	(iv)	(ii)
(C)	(iv)	(iii)	(i)	(ii)
(D)	(i)	(iv)	(iii)	(ii)

38.

	List – I		List – II
(a)	Schmitt trigger	(i)	Linear wave shaping
(b)	Clipping	(ii)	Hysteresis
(c)	Op-amp	(iii)	Barkhausen Criterion
(d)	Oscillators	(iv)	Slew rate

Codes :

	(a)	(b)	(c)	(d)
(A)	(i)	(iii)	(ii)	(iv)
(B)	(iii)	(ii)	(i)	(iv)
(C)	(ii)	(i)	(iv)	(iii)
(D)	(iv)	(ii)	(iii)	(i)

39.

	List – I		List – II
(a)	JK flip-flop	(i)	Parallel output
(b)	Serial in parallel out	(ii)	Octate
(c)	Combination logic	(iii)	Race around
(d)	k-map	(iv)	Flip-flop

Codes :

	(a)	(b)	(c)	(d)
(A)	(iv)	(iii)	(i)	(ii)
(B)	(iii)	(i)	(iv)	(ii)
(C)	(i)	(ii)	(iv)	(iii)
(D)	(ii)	(iv)	(i)	(iii)

40.

	List – I		List – II
(a)	8086	(i)	Timer
(b)	8051	(ii)	6-byte Que
(c)	8155	(iii)	Accumulator clear
(d)	Zero flag	(iv)	4–I/O ports

Codes :

	(a)	(b)	(c)	(d)
(A)	(ii)	(iv)	(i)	(iii)
(B)	(i)	(ii)	(iv)	(iii)
(C)	(iii)	(i)	(ii)	(iv)
(D)	(iv)	(iii)	(i)	(ii)

41.

	List – I		List – II
(a)	main ( )	(i)	Object oriented programming
(b)	return (x, y)	(ii)	Syntax error
(c)	C++	(iii)	Program execution start
(d)	print ("my name");	(iv)	Invalid statement

Codes :

	(a)	(b)	(c)	(d)
(A)	(i)	(ii)	(iv)	(iii)
(B)	(iv)	(i)	(ii)	(iii)
(C)	(iii)	(iv)	(i)	(ii)
(D)	(ii)	(i)	(iv)	(iii)

42.

	List – I		List – II
(a)	SCR	(i)	bilateral
(b)	UJT	(ii)	dc to ac
(c)	Triac	(iii)	intrinsic stand off ratio
(d)	Inverter	(iv)	holding current

Codes :

	(a)	(b)	(c)	(d)
(A)	(i)	(iv)	(ii)	(iii)
(B)	(ii)	(i)	(iii)	(iv)
(C)	(iii)	(ii)	(iv)	(i)
(D)	(iv)	(iii)	(i)	(ii)

43.

	List – I		List – II
(a)	Single Mode Fiber	(i)	Population inversion
(b)	DWDM	(ii)	Isolator
(c)	Optocoupler	(iii)	0.1 nm
(d)	LASER	(iv)	V < 2.405

Codes :

	(a)	(b)	(c)	(d)
(A)	(iv)	(iii)	(ii)	(i)
(B)	(iii)	(iv)	(ii)	(i)
(C)	(iii)	(ii)	(iv)	(i)
(D)	(i)	(ii)	(iii)	(iv)

44.

	List – I		List – II
(a)	$\nabla^2 V = 0$	(i)	Gauss's law
(b)	$\nabla^2 V = -\dfrac{\rho}{\in}$	(ii)	Laplace equation
(c)	$\nabla \cdot \vec{D} = \rho_v$	(iii)	Poisson's equation
(d)	$\nabla \cdot \vec{J} = -\rho_v$	(iv)	Equation of continuity

Codes :

	(a)	(b)	(c)	(d)
(A)	(ii)	(iii)	(i)	(iv)
(B)	(i)	(ii)	(iii)	(iv)
(C)	(iv)	(iii)	(i)	(ii)
(D)	(iv)	(ii)	(i)	(iii)

45.

	List – I		List – II
(a)	Single Mode Fiber	(i)	detector
(b)	Polarized Mode Dispersion	(ii)	transmitter
(c)	Photo diode	(iii)	$Ps/\sqrt{km}$
(d)	LED	(iv)	0.2 dB/km

Codes :

	(a)	(b)	(c)	(d)
(A)	(iii)	(i)	(iv)	(ii)
(B)	(iv)	(iii)	(i)	(ii)
(C)	(iv)	(i)	(ii)	(iii)
(D)	(i)	(ii)	(iii)	(iv)

Read the paragraph and answer the questions **46** to **50**.

Two-port networks : A two port network consists of one input port (1-1′) and one output port (2-2′). The port variables are currents and voltages. Any external network connected either at the input or at the output port is called termination. The number of equations to describe relationship amongst the port voltages and currents for an n-port network will be n with 2n variables.
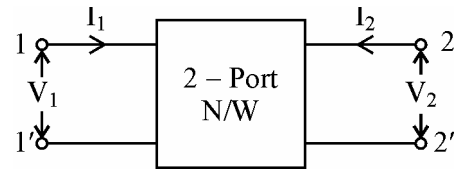
For a two-port network the four variables are V_1, I_1 at the input port and V_2, I_2 at the output port. Only two out of these four variables are independent.

Study of two-port network is important in synthesizing and designing networks like filters, matching networks, wave shaping networks transmission lines and many more.

The two port parameters include

1. Open circuit impedance Z-parameters.
2. Short circuit admittance Y-parameters.
3. Transmission or Chain ABCD parameters.
4. Inverse transmission A' B' C' D' parameters.
5. Hybrid i.e. h-parameters and
6. Inverse hybrid g-parameters.
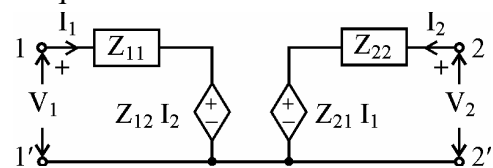
The Z-parameters evaluated from the equations.

$$V_1 = Z_{11} I_1 + Z_{12} I_2$$
$$V_2 = Z_{21} I_1 + Z_{22} I_2$$

Furnish information about input driving point impedance (Z_{11}), forward transfer impedance with output port open (Z_{12}) and reverse transfer impedance with input open circulated (Z_{22})

The equations for Z-parameters lead to equivalent circuit are as follows :

A network becomes reciprocal when $Z_{12} = Z_{21}$ and symmetrical when $Z_{11} = Z_{22}$.

Z, Y, h and transmission parameters are related to each other. Relation of Z and h parameters is of the following type :

$$\begin{bmatrix} Z_{11} & Z_{12} \\ Z_{21} & Z_{22} \end{bmatrix} = \begin{bmatrix} \dfrac{\Delta h}{h_{22}} & \dfrac{h_{12}}{h_{22}} \\ -\dfrac{h_{11}}{h_{22}} & \dfrac{1}{h_{22}} \end{bmatrix}$$

$$\Delta h = h_{11}h_{22} - h_{12}h_{21}$$

and

$$\begin{bmatrix} h_{11} & h_{12} \\ h_{21} & h_{22} \end{bmatrix} = \begin{bmatrix} \dfrac{\Delta Z}{Z_{22}} & \dfrac{Z_{12}}{Z_{22}} \\ -\dfrac{Z_{21}}{Z_{22}} & \dfrac{1}{Z_{22}} \end{bmatrix}$$

$$\Delta Z = Z_{11}Z_{22} - Z_{12}Z_{21}$$

A given two-port network can be built using simple two-port networks and interconnecting them. A two port network can be designed by combining simple two port structures as building blocks.

The two port networks can be connected in series or in parallel or in series-parallel. The open circuit impedance parameter representation for example is useful in characterizing series connected two-port networks. The overall Z-parameter matrix for series connected two-port networks is the sum of the Z-matrices of each individual two-port networks connected in series. The short circuit impedance parameter representation helps in characterizing parallel-connected two-port network. Using such connections other parameter representations are possible.

46. Which parameters are useful to construct a model for transistor ?
(A) Z   (B) Y
(C) h   (D) g

47. h-parameter representation is the dual of _____ parameter representation
(A) ABCD   (B) g
(C) Y   (D) Z

48. For a two port network the Z-parameters are
$$Z_{11} = 6\Omega, Z_{22} = 6\Omega, Z_{21} = 2\Omega$$
and $Z_{12} = 2\Omega$
h_{12} is _____
(A) $6\,\Omega$ (B) $2\,\Omega$
(C) $3\,\Omega$ (D) $113\,\Omega$

49. Z and Y-parameters are related. If Z parameters are known Y-parameters can be evaluated. Why Z and Y parameters are separately defined ?
(A) for academic reason
(B) Y-parameters are difficult to evaluate.
(C) Z-parameters cannot be evaluated at high frequency due to open circuit condition.
(D) Y parameters cannot be evaluated from Z parameters and vice-a-versa.

50. For a two port-network given below what are its Z-parameters ?
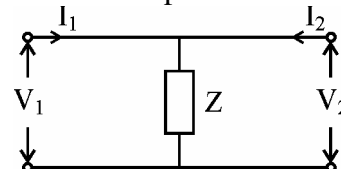
(A) $\begin{bmatrix} Z & 0 \\ 0 & Z \end{bmatrix}$ (B) $\begin{bmatrix} 0 & Z \\ Z & 0 \end{bmatrix}$

(C) $\begin{bmatrix} Z & Z \\ Z & 0 \end{bmatrix}$ (D) $\begin{bmatrix} Z & Z \\ Z & Z \end{bmatrix}$

Space For Rough Work