PAPER-II
ELECTRONIC SCIENCE

Signature and Name of Invigilator

1. (Signature) _____

   (Name) _____

2. (Signature) _____

   (Name) _____

D 8 8 1 2

Time : 1 ¹/₄ hours]

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

OMR Sheet No. : ....

(To be filled by the Candidate)

Roll No. [ ][ ][ ][ ][ ][ ][ ][ ]

(In figures as per admission card)

Roll No._____

(In words)

[Maximum Marks : **100**

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

Instructions for the Candidates

1. Write your roll number in the space provided on the top of this page.
2. This paper consists of fifty multiple-choice type of questions.
3. At the commencement of examination, the question booklet will be given to you. In the first 5 minutes, you are requested to open the booklet and compulsorily examine it as below :
   (i) To have access to the Question Booklet, tear off the paper seal on the edge of this cover page. Do not accept a booklet without sticker-seal and do not accept an open booklet.
   (ii) **Tally the number of pages and number of questions in the booklet with the information printed on the cover page. Faulty booklets due to pages/questions missing or duplicate or not in serial order or any other discrepancy should be got replaced immediately by a correct booklet from the invigilator within the period of 5 minutes. Afterwards, neither the Question Booklet will be replaced nor any extra time will be given.**
   (iii) After this verification is over, the OMR Sheet Number should be entered on this Test Booklet.
4. Each item has four alternative responses marked (A), (B), (C) and (D). You have to darken the circle as indicated below on the correct response against each item.
   Example : Ⓐ Ⓑ ● Ⓓ
   where (C) is the correct response.
5. Your responses to the items are to be indicated in the **OMR Sheet given inside the Paper I Booklet only.** If you mark at any place other than in the circle in the OMR Sheet, it will not be evaluated.
6. Read instructions given inside carefully.
7. Rough Work is to be done in the end of this booklet.
8. If you write your Name, Roll Number, Phone Number or put any mark on any part of the OMR Sheet, except for the space allotted for the relevant entries, which may disclose your identity, or use abusive language or employ any other unfair means, you will render yourself liable to disqualification.
9. You have to return the test question booklet and Original OMR Sheet to the invigilators at the end of the examination compulsorily and must not carry it with you outside the Examination Hall. You are, however, allowed to carry duplicate copy of OMR Sheet on conclusion of examination.
10. **Use only Blue/Black Ball point pen.**
11. **Use of any calculator or log table etc., is prohibited.**
12. **There is no negative marks for incorrect answers.**

परीक्षार्थियों के लिए निर्देश

1. पहले पृष्ठ के ऊपर नियत स्थान पर अपना रोल नम्बर लिखिए ।
2. इस प्रश्न-पत्र में पचास बहुविकल्पीय प्रश्न हैं ।
3. परीक्षा प्रारम्भ होने पर, प्रश्न-पुस्तिका आपको दे दी जायेगी । पहले पाँच मिनट आपको प्रश्न-पुस्तिका खोलने तथा उसकी निम्नलिखित जाँच के लिए दिये जायेंगे, जिसकी जाँच आपको अवश्य करनी है :
   (i) प्रश्न-पुस्तिका खोलने के लिए उसके कवर पेज पर लगी कागज की सील को फाड़ लें । खुली हुई या बिना स्टीकर-सील की पुस्तिका स्वीकार न करें ।
   (ii) **कवर पृष्ठ पर छपे निर्देशानुसार प्रश्न-पुस्तिका के पृष्ठ तथा प्रश्नों की संख्या को अच्छी तरह चैक कर लें कि ये पूरे हैं । दोषपूर्ण पुस्तिका जिनमें पृष्ठ/प्रश्न कम हों या दुबारा आ गये हों या सीरियल में न हों अर्थात् किसी भी प्रकार की त्रुटिपूर्ण पुस्तिका स्वीकार न करें तथा उसी समय उसे लौटाकर उसके स्थान पर दूसरी सही प्रश्न-पुस्तिका ले लें । इसके लिए आपको पाँच मिनट दिये जायेंगे । उसके बाद न तो आपकी प्रश्न-पुस्तिका वापस ली जायेगी और न ही आपको अतिरिक्त समय दिया जायेगा ।**
   (iii) इस जाँच के बाद OMR पत्रक की क्रम संख्या इस प्रश्न-पुस्तिका पर अंकित कर दें ।
4. प्रत्येक प्रश्न के लिए चार उत्तर विकल्प (A), (B), (C) तथा (D) दिये गये हैं । आपको सही उत्तर के वृत्त को पेन से भरकर काला करना है जैसा कि नीचे दिखाया गया है ।
   उदाहरण : Ⓐ Ⓑ ● Ⓓ
   जबकि (C) सही उत्तर है ।
5. प्रश्नों के उत्तर **केवल प्रश्न पत्र I के अन्दर दिये गये OMR पत्रक पर ही** अंकित करने हैं । यदि आप OMR पत्रक पर दिये गये वृत्त के अलावा किसी अन्य स्थान पर उत्तर चिह्नांकित करते हैं, तो उसका मूल्यांकन नहीं होगा ।
6. अन्दर दिये गये निर्देशों को ध्यानपूर्वक पढ़ें ।
7. कच्चा काम (Rough Work) इस पुस्तिका के अन्तिम पृष्ठ पर करें ।
8. यदि आप OMR पत्रक पर नियत स्थान के अलावा अपना नाम, रोल नम्बर, फोन नम्बर या कोई भी ऐसा चिह्न जिससे आपकी पहचान हो सके, अंकित करते हैं अथवा अभद्र भाषा का प्रयोग करते हैं, या कोई अन्य अनुचित साधन का प्रयोग करते हैं, तो परीक्षा के लिये अयोग्य घोषित किये जा सकते हैं ।
9. आपको परीक्षा समाप्त होने पर प्रश्न-पुस्तिका एवं मूल OMR पत्रक निरीक्षक महोदय को लौटाना आवश्यक है और परीक्षा समाप्ति के बाद उसे अपने साथ परीक्षा भवन से बाहर न लेकर जायें । हालांकि आप परीक्षा समाप्ति पर OMR पत्रक की डुप्लीकेट प्रति अपने साथ ले जा सकते हैं ।
10. केवल नीले/काले बाल प्वाईंट पेन का ही इस्तेमाल करें ।
11. किसी भी प्रकार का संगणक (कैलकुलेटर) या लाग टेबल आदि का प्रयोग वर्जित है ।
12. गलत उत्तरों के लिए कोई अंक काटे नहीं जाएँगे ।

ELECTRONIC SCIENCE
Paper – II

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

1. For a JFET I_{DSS} = 8 mA and peak voltage V_p = –8V, what will be the drain current for gate to source voltage of –2V ?
   (A) 4.5 mA   (B) 8 mA
   (C) 16 mA   (D) 12 mA
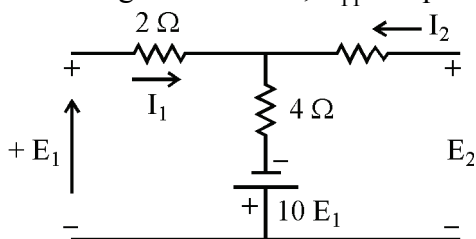
2. The leakage current in silicon p-n junction at room temperature is of the order of
   (A) mA   (B) μA
   (C) μμA   (D) Amp

3. A tree in a network has a
   (A) closed path
   (B) no closed path
   (C) no nodes
   (D) no branches

4. In the given network, Z_{11} is equal to

   (A) $\frac{-6}{11}$ Ohm   (B) $\frac{6}{11}$ Ohm

   (C) $\frac{4}{11}$ Ohm   (D) $\frac{2}{11}$ Ohm

5. Which is a three-terminal negative voltage regulator IC ?
   (A) 78 XX   (B) IC 723
   (C) LM 317   (D) 79 XX

6. Three identical stages have overall upper 3 dB frequency of 2 KHz and lower 3 dB frequency of 20 Hz. What is the value of f_H of each stage ?
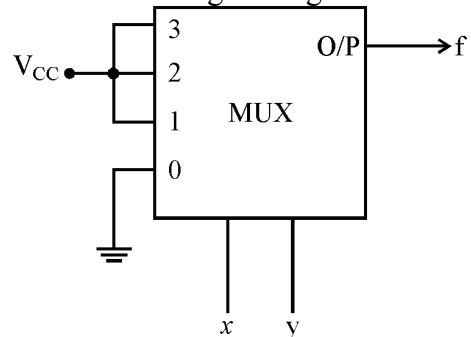   (A) 13 KHz   (B) 26 KHz
   (C) 39 KHz   (D) 52 KHz

7. A combinational circuit has inputs A, B and C and its K-map is as shown, the output of the circuit will be

C \ AB	00	01	11	10
0	0	1	0	1
1	1	0	1	0

   (A) $(\overline{A}B + A\overline{B})\,C$
   (B) $(\overline{AB} + AB)\,\overline{C}$
   (C) $\overline{A}\,\overline{B}\,\overline{C}$
   (D) $A \oplus B \oplus C$

8. The output f of the 4-to-1 Mux shown in the given figure is

   (A) $\overline{xy} + x$ (B) $x + y$
   (C) $\overline{x} + \overline{y}$ (D) $x\overline{y}$

9. Microprocessor 8086 allows floating point arithmetic calculations in
   (A) Maximum mode
   (B) Minimum mode
   (C) Both maximum and minimum modes
   (D) Neither in maximum nor in minimum mode

10. Which of the following chip is used in 8085 microprocessor 3-chip configuration ?
    (A) IC 8255   (B) IC 8155
    (C) IC 8251   (D) IC 8257

11. C Language is a _____
    (A) High level language
    (B) Low level language
    (C) Machine level language
    (D) Middle level language

12. In a 'C' language expression, if the following expressions appear, which will be evaluated first ?
    (A) $x + y$ (B) $x \cdot y$
    (C) $(x + y)$ (D) x/y

13. If $\bar{E} = 2$ v/m of a wave in free space, the value of magnetic field (H) is
    (A) $\dfrac{1}{60\pi}$ A/m   (B) 60π A/m
    (C) 120π A/m   (D) 240π A/m

14. The radiation resistance of a Hertizian dipole antenna of length $\dfrac{\lambda}{60}$ is
    (A) 0.493 Ohm   (B) 0.22 Ohm
    (C) 2.2 Ohm   (D) 22 Ohm

15. A 20 kW carrier is sinusoidally modulated by two carriers corresponding to modulation index of 30% and 40% respectively. The total radiated power is
    (A) 25 kW   (B) 22.5 kW
    (C) 45.0 kW   (D) 35.0 kW

16. ASCII code has 128 characters, which are binary coded. If a computer generates 10^6 characters per second, then minimum band width required to transmit this signal will be
    (A) 1.4 mbps   (B) 14 mbps
    (C) 7 mbps   (D) 0.7 mbps

17. When the current through SCR is greater than holding current, then the voltage across the SCR is
    (A) 1.4 V
    (B) 0 V
    (C) Supply voltage
    (D) Half the load voltage

18. Dispersion shifted wave length is
    (A) 800 nm   (B) 1550 nm
    (C) 1310 nm   (D) 1200 nm

19. The most suitable instrument for the measurement of voltage is
    (A) DVM
    (B) Analog voltmeter
    (C) CRO
    (D) DMM

20. The characteristic polynomial of a system is
    $q(s) = 2s^5 + s^4 + 4s^3 + 2s^2 + 2s + 1$
    The system is
    (A) Stable
    (B) Marginally stable
    (C) Unstable
    (D) Oscillatory

Directions :
    Q. No(s) **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 not correct explanation of (A).
    (C) (A) is true, but (R) is false.
    (D) (A) is false, but (R) is true.

21. **Assertion (A) :** Tunnel diode provides oscillations in the microwave region.
    Reason (R) : The equivalent RC model of tunnel diode gives frequency in the microwave region.

22. **Assertion (A) :** The roots of the denominator of a network function decide its stability.

    Reason (R) : The poles on real axis determine the damping factor of the system.

23. **Assertion (A) :** The fast changing inputs do not depend upon slew rate property of an OPAMP.

    Reason (R) : Schmitt trigger does not work on the slew rate property of an OPAMP.

24. **Assertion (A) :** A parallel comparator ADC requires in – built no. of comparators $= 2^N - 1$.

    Reason (R) : The speed of parallel comparator is limited by the speed of comparator.

25. **Assertion (A) :** Microcontrollers are preferred in Real time applications.

    Reason (R) : The on chip I/O integration has no bearing on the speed of microcontroller.

26. **Assertion (A) :** In 'FORTRAN' pointers are provided.

    Reason (R) : Pointers help to work with actual physical addresses.

27. **Assertion (A) :** Divergence theorem is applicable for both static and time varying fields.

    Reason (R) : It is used to find enclosed charge from the knowledge of either $\overline{D}$ or $\overline{E}$.

28. **Assertion (A) :** The back e.m.f. of a d.c. motor depends upon series winding and armature resistance.

    Reason (R) : When there is no load, the back emf is minimum.

29. **Assertion (A) :** By using wavelength division, multiplexing the capacity of an optical fibre can be enhanced.

    Reason (R) : The separation between two adjacent channels in WDM is of the order of 50 nm.

30. **Assertion (A) :** The sign of all terms in the first row of Routh's array are checked, for stability considerations.

    Reason (R) : The number of sign changes equals the no. of roots on the right hand side of s-plane.

31. Consider the following four transistors :
    1. CE mode   2. CC mode
    3. MOSFET   4. FET
    The correct order in which, the input impedance increases is
    (A) 1, 2, 4, 3   (B) 1, 2, 3, 4
    (C) 1, 3, 2, 4   (D) 4, 3, 2, 1

32. The correct order in which the power dissipation in transistor in power amplifiers decreases :
    1. Class A   2. Class C
    3. Class B   4. Class AB
    The correct order is
    (A) 1, 3, 2 and 4
    (B) 1, 3, 4 and 2
    (C) 1, 2, 3, 4
    (D) 4, 3, 2, 1

33. The following are the interrupts of 8085 microprocessor :
1. INTR 2. TRAP
3. RST 7.5 4. RST 5.5
The correct order in which these interrupts will be executed, if arrive simultaneously :
(A) 1, 2, 3, 4 (B) 2, 3, 1, 4
(C) 2, 3, 4, 1 (D) 4, 1, 2, 3

34. The following are the oscillators :
1. Crystal
2. Weinbridge
3. Colpitt's
4. Tunnel diode oscillator
The correct sequence of decreasing order of the frequency of oscillation will be :
(A) 4, 1, 3, 2 (B) 4, 1, 2, 3
(C) 4, 3, 2, 1 (D) 4, 2, 3, 1

35. Following are the controllers :
1. On-off
2. PID
3. PI
The correct order of the decrease in error output is
(A) 1, 2, 3 (B) 1, 3, 2
(C) 3, 2, 1 (D) 3, 1, 2

Directions : Q. Nos. **36** to **45** :
In the following questions, 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.	base width modulation
b.	BJT	ii.	AGC
c.	FET	iii.	–2 mV/°C
d.	MOSFET	iv.	low power consumption

Codes :

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

37.

	List – I		List – II
a.	Stability	i.	transient analysis
b.	Y-parameters	ii.	discrete time domain analysis
c.	Laplace transform	iii.	hybrid π model
d.	Z-transform	iv.	location of poles

Codes :

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

38.

	List – I		List – II
a.	Stability factor	i.	Large bandwidth
b.	Loop gain ≥ 1	ii.	Voltage divider bias
c.	Lock range	iii.	Oscillators
d.	Negative feedback	iv.	PLL

Codes :

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

39.

	List – I		List – II
a.	Combinational logic	i.	Sequential circuits
b.	Counters	ii.	ROM
c.	LIFO	iii.	DVM
d.	State diagram	iv.	Shift register

Codes :

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

40.

	List – I		List – II
a.	8085	i.	variable port addressing
b.	8086	ii.	serial communication
c.	8279	iii.	register bank
d.	8051	iv.	2-key lockout

Codes :

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

41.

	List – I		List – II
a.	while (1)	i.	on-off control implementation
b.	paranthesis	ii.	infinite
c.	Switch-case	iii.	change of precedence
d.	If-then	iv.	multiple processing

Codes :

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

42.

	List – I		List – II
a.	$\nabla \times \overline{H}$	i.	continuity equation
b.	$\nabla \times \overline{E}$	ii.	current density
c.	$\nabla \cdot \overline{D}$	iii.	Faraday's law of induction
d.	$\nabla \cdot \overline{J}$	iv.	Gausses law

Codes :

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

43.

	List – I		List – II
a.	QPSK	i.	deviation
b.	Hamming code	ii.	I.F.
c.	Superhetrodyne	iii.	Error correction
d.	Frequency modulation	iv.	90°

Codes :

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

44.

	List – I		List – II
a.	relaxation oscillator	i.	PWM
b.	S.M.P.S.	ii.	triac
c.	population inversion	iii.	UJT
d.	bi-directional control	iv.	Laser

Codes :

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

45.

	List – I		List – II
a.	Strain measurement	i.	Pt-100
b.	temperature measurement	ii.	load cell
c.	Lissajous figures	iii.	bio-medical signals
d.	E.M.G.	iv.	C.R.O.

Codes :

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

Read the passage below and answer the questions **46** to **50**, that follows based on your understanding of the passage :

Many instruments require dc power of their operation. This power is available from a portable cell, however, the power output is low besides other problems. AC power is continuously and easily available, so it is convenient to use it. However, ac power must be converted into dc power.

The devices such as half-wave, full wave and bridge rectifiers convert bi-directional voltage to uni-directional voltage. However, the output has large ripple contents. Filters are used to reduce the ripple significantly. Various filters circuits and L, C, LC and CLC. The power supply with rectifier and filter is still unregulated.

The output of such power supplies varies with variations in a.c. mains voltage, load current and temperature.

In order to maintain the output at constant level, voltage or current regulation is necessary. This is obtained by using series or shunt feedback. In addition to regulation, the power supply also requires protection e.g. overload, over current or short circuit protection. Pre- regulation is also carried out to improve the stability.

Regulators can be designed by using discrete components. However, IC regulators are also available. These regulators have facilities like :

(i)   voltage / current boosting

(ii)   thermal shut-down

(iii) floating point to facilitate higher output voltage.

(iv)   switching regulator to reduce the power dissipation.

46. The minimum supply voltage to operate IC 7815 is
(A)   15 V
(B)   17 V
(C)   25 V
(D)   40 V

47. In low voltage, low current model, IC 723 gives output voltage in the range of
(A)   2 to 7 V
(B)   5 to 10 V
(C)   0 to 10 V
(D)   0 to 7 V

48. For a d.c. output of 30 V, from a full wave rectifier, the PIV rating of the diode should be minimum
(A)   50 V
(B)   75 V
(C)   100 V
(D)   200 V

49. The critical inductance in mains power supply ensures that the current through 'L' never becomes zero. For this, critical value of inductance is
(A) $\dfrac{R_L}{310}$
(B) $\dfrac{R_L}{450}$
(C) $\dfrac{R_L}{620}$
(D) $\dfrac{R_L}{942}$

50. In series pass voltage regulator using zener diode, the function of zener diode is a
(A)   Voltage regulator
(B)   Voltage comparator
(C)   Breakdown diode
(D)   Temperature compensator

Space For Rough Work