PAPER-II
ELECTRONIC SCIENCE

Signature and Name of Invigilator

1. (Signature) _____

   (Name) _____

2. (Signature) _____

   (Name) _____

OMR Sheet No. : .....
(To be filled by the Candidate)

Roll No. | | | | | | | | |
(In figures as per admission card)

Roll No._____
(In words)

S 8 8 1 3

Time : **1 $^{1}/_{4}$** hours] [Maximum Marks : **100**

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

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 / polythene bag on the booklet. Do not accept a booklet without sticker-seal / without polythene bag 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 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 पुस्तिका पर लगी कागज की सील / पोलिथीन बैग को फाड़ लें । खुली हुई या बिना स्टीकर-सील / बिना पोलिथीन बैग 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 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 of **two (2)** marks each. **All** questions are compulsory.

1. The p-n junction diode is a
(A) Passive device
(B) Vacuum device
(C) Unilateral device
(D) Bilateral device

2. A semiconductor has _____ temperature co-efficient of resistance
(A) Zero (B) Positive
(C) Negative (D) One

3. A JFET has
(A) One built-in diode
(B) Two built-in diode
(C) Three built-in diode
(D) Four built-in diode

4. The superposition theorem is essentially based on the concept of
(A) Quality
(B) Linearity
(C) Reciprocity
(D) Non-linearity

5. A counter that counts in binary from 0000 to 1010 is known as
(A) Binary counter
(B) Decade counter
(C) BCD counter
(D) Mod-10 counter

6. A digital multiplexer is a/an
(A) Combinational circuit
(B) Sequential circuit
(C) Amplifier
(D) Memory device

7. An 8086 has how many number of flags ?
(A) 5 (B) 7
(C) 9 (D) 11

8. In 8085, microprocessor, the register which holds the address of the next instruction to be executed is
(A) Instruction register
(B) Stack pointer
(C) Temporary register
(D) Program counter

9. The Pentium III processor is a
(A) 16 bit processor
(B) 32 bit processor
(C) 64 bit processor
(D) 128 bit processor

10. Demodulation is a process
(A) done at the transmitter
(B) of filtering the carrier
(C) of removing the sidebands
(D) similar to modulation

11. The terms frequency pushing and pulling are related to
(A) Reflex Klystron
(B) Two cavity klystron
(C) Pulsed radar system
(D) Magnetron

12. Out of the following memory types, one that is volatile is
(A) Magnetic disc
(B) Ferrite core
(C) Semiconductor ROM
(D) Semiconductor RAM

13. When Q of an antenna increases, the bandwidth
(A) increases
(B) decreases
(C) stays constant equal to zero
(D) stays constant equal to unity

14. The value of intrinsic-stand-off ratio of UJT should be
(A) >1 (B) <1
(C) 0 (zero) (D) 10

15. In a normal ECG waveform which wave has the maximum amplitude ?
(A) P wave (B) R wave
(C) Q wave (D) T wave

16. The output impedance in an ideal Op-Amp is
(A) Zero (B) 20 Ω
(C) 60 Ω (D) infinity

17. What will be the output of the following statements ?
int a = 5, b = 2, c = 10, i = a > b
Void main ( )
{print f("hello"); main ( );}
(A) 1
(B) 2
(C) infinite number of times
(D) 10

18. Which data communication method is used for sending data in both directions at the same time ?
(A) Super duplex
(B) Simplex
(C) Half duplex
(D) Full duplex

19. The highest data rate in fiber optic communication occurs in
(A) Single-mode fiber
(B) Graded-index fiber
(C) Multimode fiber
(D) Co-axial cable

20. Routh's array for a system is given below :

S^4	1	3	5
S^3	1	2	9
S^2	1	5	
S^1	–3		
S^0	5		

The system is
(A) Stable
(B) Unstable
(C) Marginally stable
(D) Conditionally stable

Assertion-Reason type questions :

The following items consist of two statements, one labelled as 'Assertion A' and the other labelled the 'Reason (R)'. You are to examine these two statements 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 sheet 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 the correct explanation of (A).
(C) (A) is true and (R) is false.
(D) (A) is false and (R) is true.

21. **Assertion (A) :** In a common base amplifier voltage gain is more than 1.
Reason (R) : In a common base amplifier current gain is less than 1.

22. **Assertion (A) :** Op-Amp is used for amplification of weak signals.
Reason (R) : To rectify EMG signals, precision rectifiers are used.

23. **Assertion (A) :** Gray is unweighted code.

Reason (R) : Gray code is not self complementary.

24. **Assertion (A) :** TDM and FDM accomplish the same end by different means.

Reason (R) : FDM involves simpler instrumentation as compared to TDM.

25. **Assertion (A) :** A SSB system is used for broadcasting applications.

Reason (R) : The saving of power in SSB system is $\geq 75\%$.

26. **Assertion (A) :** Dual slope A/D converter is the most preferred conversion technique employed in most of the digital multimeters.

Reason (R) : Dual slope A/D converter provides high accuracy while at the same time suppresses the HUM effect on the input signal.

27. **Assertion (A) :** The system of propagation in waveguides is in accordance to field theory.

Reason (R) : The system of propagation in transmission line is in accordance with circuit theory.

28. **Assertion (A) :** For a function to be odd $f(-x) = -f(x)$.

Reason (R) : If a function is odd, its Fourier series only contains cosine terms.

29. **Assertion (A) :** A number of thyristors operating in parallel can not share a common heat sink.

Reason (R) : For simultaneous firing of the thyristor opto isolators may be employed in the gate driving circuit.

30. **Assertion (A) :** ABCD parameters are transmission parameters.

Reason (R) : The relationship between input and output is given by :

$$\begin{bmatrix} V_1 \\ I_1 \end{bmatrix} = \begin{bmatrix} A & B \\ C & D \end{bmatrix} \begin{bmatrix} V_2 \\ I_2 \end{bmatrix}$$

31. Consider the following devices :

1. RTL
2. High Speed TTL
3. ECL
4. CMOS

The correct sequence of their decrease in power dissipation is

(A) 3, 1, 2, 4

(B) 3, 1, 4 ,2

(C) 1, 3, 2, 4

(D) 3, 2, 4, 1

32. Arrange the following in terms of their increasing conductivity :

1. Copper
2. Steel
3. Leather
4. Rubber

The correct sequence is

(A) 4, 3, 2, 1

(B) 4, 3, 1, 2

(C) 3, 4, 2, 1

(D) 2, 1, 3, 4

33. Following are the EM waves :

1. Red colour light
2. Blue colour light
3. Microwaves
4. X-rays

The correct sequence of decreasing order of wavelength is

(A) 2, 4, 3, 1

(B) 1, 3, 2, 4

(C) 3, 1, 4, 2

(D) 3, 1, 2, 4

34. Following are the process steps to fabricate an IC :

1. Crystal growth
2. Epitaxial growth
3. Photo etching
4. Diffusion
5. Vacuum evaporation of Aluminium

The correct sequence of fabrication is

(A) 1, 5, 3, 4, 2

(B) 1, 2, 3, 4, 5

(C) 1, 3, 2, 4, 5

(D) 1, 2, 4, 3, 5

35. Following are the modulation/ multiplexing techniques :

1. AM
2. FM
3. CDMA
4. WDM

The correct sequence of carrier frequency in decreasing order is

(A) 1, 2, 3, 4

(B) 4, 3, 1, 2

(C) 4, 3, 2, 1

(D) 3, 4, 2, 1

36. Match the following :

List – I	**List – II**
a. LED	i. Heavily doped
b. APD	ii. Coherent radiation
c. Tunnel diode	iii. Spontaneous emission
d. Laser	iv. Current gain

The correct sequence is given by

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

37. Match the following :

List – I	**List – II**
a. Cassegrain antenna	i. Large B.W.
b. Yagi antenna	ii. Direction finding
c. Parabolic reflector antenna	iii. Radar
d. Loop antenna	iv. Directional transmission

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

38. Match the lists :

List – I (Band gap in eV)	**List – II (Materials)**
a. 0.67	i. Ga As
b. 1.1	ii. Cadmium sulphate
c. 1.4	iii. Si
d. 2.4	iv. Ge

The correct matching order is

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

39. Match the following :

List – I	List – II
a. Voltage series feedback connection	i. increases input impedance
b. Voltage shunt feedback connection	ii. decreases the input impedance
c. Current series feedback connection	iii. increases the output impedance
d. Voltage series feedback connection	iv. decreases the output impedance

The correct matching order is

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

40. Match the following lists :

List – I	List – II
a. Electro-myogram	i. Tracing brain waves
b. Electro-cardiogram	ii. Tracing of muscular waves
c. Electro-encephalogram	iii. Measurement of air in lungs
d. Spirometer	iv. A record of electrical activity of heart

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

41. Match the following :

List – I	List – II
a. Removes ac ripple	i. Zener diode
b. Supplies ac input voltage	ii. Filter capacitor
c. Constant dc output voltage	iii. No output voltage
d. Filter choke inductor	iv. Power transformer

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

42. Match the following lists :

List – I	List – II
a. Maxwells bridge	i. Measurement of unknown inductance
b. Hay's bridge	ii. Measurement of high Q of coils
c. Schering's bridge	iii. Precision measurement of capacitance
d. Weins bridge	iv. To measure frequency

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

43. Match the following lists :

List – I	List – II
a. Gamma rays	i. 400-700 nm
b. Visible light	ii. 1-10 cm
c. Radiowaves	iii. $3 \times 10^{+3}$ m
d. Microwaves	iv. 4×10^{-11} m

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

44. Match the List – I and List – II :

	List – I (Type of counters)	**List – II (No. of flip flops required)**
a.	Mod-6	i. 3
b.	Mod-11	ii. 4
c.	Mod-31	iii. 5

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

45. Match the following lists :

	List – I (Units)	**List – II (Quantity)**
a.	ps/nm/km	i. Attenuation
b.	dB/km	ii. Magnetic field
c.	cm^2/v-s	iii. Dispersion
d.	Tesla	iv. Mobility

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

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

p-i-n photodiode contains a layer of intrinsic semi-conductor material sandwiched between p-and-n regions. The depletion layer is wholly contained within the i region. Thickness of the intrinsic region can be adjusted to produce device with optimum sensitivity and frequency response. P-i-n photodiode is most common type of depletion layer photodiode.

The other class of photodiodes, avalanche photodiodes, are reverse-biased p-n junction diodes that are operated at voltages above the breakdown voltage. Current multiplication of electron-hole pairs generated by the incident electromagnetic radiation, occurs due to avalanche process. The photomultiplication factor M_{pn} is defined as ratio of the multiplied photocurrent I_{pm} to the photocurrent I_{pho} at voltage below breakdown where no avalanche multiplication takes place.

46. Semiconductors are sensitive to

(A) heat

(B) magnetic field

(C) light energy

(D) all of the above

47. Which of the following elements is a semiconductor ?

(A) Germanium

(B) Copper

(C) Carbon

(D) Phosphorous

48. When a reverse bias is applied to a junction diode

(A) potential barrier is lowered

(B) majority carrier current is increased

(C) minority carrier current is increased

(D) potential barrier is raised

49. Photo-diode is reverse biased because

(A) only one side is illuminated

(B) majority swept are reverse biased across the function

(C) reverse current is small as compared to photo current

(D) reverse current is large as compared to photocurrent

50. Avalanche photodiodes are preferred over PIN diodes in optical communication systems because of

(A) Speed of operation

(B) Higher sensitivity

(C) Larger bandwidth

(D) Larger power handling capacity

Space For Rough Work