D–8804

Time : 1¼ hours]

PAPER–II

ELECTRONIC SCIENCE

[**Maximum Marks : 100**]

Number of Pages in this Booklet : **12**

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

Instructions for the Candidates	**परीक्षार्थियों के लिए निर्देश**
1. Write your roll number in the space provided on the top of this page and also on the Answer Sheet given inside this booklet.	1. पहले पृष्ठ के ऊपर नियत स्थान पर तथा इस पुस्तिका के अन्दर दिये गये उत्तर पत्रक पर अपना रोल नम्बर लिखिए।
2. This paper consists of fifty multiple-choice type of questions.	2. इस प्रश्न-पत्र में पचास बहुविकल्पीय प्रश्न हैं।
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 :	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) 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.	(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) **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.**	(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 अर्थात 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) After this verification is over, the Serial No. of the booklet should be entered in the Answer-sheets and the Serial No. of Answer Sheet should be entered on this Booklet.	(iii) इस जाँच के बाद प्रश्न-पुस्तिका की क्रम संख्या उत्तर-पत्रक पर अंकित करें और उत्तर-पत्रक की क्रम संख्या इस प्रश्न-पुस्तिका पर अंकित कर दें।
4. Each item has four alternative responses marked (A), (B), (C) and (D). You have to darken the oval as indicated below on the correct response against each item.	4. प्रत्येक प्रश्न के लिए चार उत्तर विकल्प (A), (B), (C) तथा (D) दिये गये हैं। आपको सही उत्तर के दीर्घवृत्त को पेन से भरकर काला करना है जैसा कि नीचे दिखाया गया है।
Example : Ⓐ Ⓑ ● Ⓓ where (C) is the correct response.	उदाहरण : Ⓐ Ⓑ ● Ⓓ जबकि (C) सही उत्तर है।
5. Your responses to the items are to be indicated in the Answer Sheet given **inside the Paper I booklet only**. If you mark at any place other than in the ovals in the Answer Sheet, it will not be evaluated.	5. प्रश्नों के उत्तर **केवल प्रश्न पत्र I के अन्दर दिये गये उत्तर-पत्रक** पर ही अंकित करने हैं। यदि आप उत्तर पत्रक पर दिये गये दीर्घवृत्त के अलावा किसी अन्य स्थान पर उत्तर चिन्हांकित करते हैं, तो उसका मूल्यांकन नहीं होगा।
6. Read instructions given inside carefully.	6. अन्दर दिये गये निर्देशों को ध्यानपूर्वक पढ़ें।
7. Rough Work is to be done in the end of this booklet.	7. कच्चा काम (Rough Work) इस पुस्तिका के अन्तिम पृष्ठ पर करें।
8. If you write your name or put any mark on any part of the test booklet, except for the space allotted for the relevant entries, which may disclose your identity, you will render yourself liable to disqualification.	8. यदि आप उत्तर-पुस्तिका पर अपना नाम या ऐसा कोई भी निशान जिससे आपकी पहचान हो सके, किसी भी भाग पर दर्शाते या अंकित करते हैं तो परीक्षा के लिये अयोग्य घोषित कर दिये जायेंगे।
9. You have to return the test question booklet to the invigilators at the end of the examination compulsorily and must not carry it with you outside the Examination Hall.	9. आपको परीक्षा समाप्त होने पर उत्तर-पुस्तिका निरीक्षक महोदय को लौटाना आवश्यक है और परीक्षा समाप्ति के बाद अपने साथ परीक्षा भवन से बाहर न लेकर जायें।
10. **Use only Blue/Black Ball point pen.**	10. केवल नीले / काले बाल प्वाईंट पैन का ही इस्तेमाल करें।
11. **Use of any calculator or log table etc., is prohibited.**	11. किसी भी प्रकार का संगणक (कैलकुलेटर) या लाग टेबल आदि का प्रयोग वर्जित है।
12. **There is NO negative marking.**	12. गलत उत्तर के लिए अंक नहीं काटे जायेंगे।

ELECTRONIC SCIENCE

PAPER – II

Note : This paper contains **fifty** (50) multiple-choice questions, each question carrying **two** (2) marks. Attempt **all** of them.

1. Light falls on one end of a long open-circuited n-type semiconductor bar for low level injection the hole current is predominantly to :

   (A) Drift
   (B) Diffusion
   (C) Both drift and diffusion
   (D) Length of bar

2. Under high electric fields, in a semiconductor with increasing electric field :

   (A) The mobility of charge carriers decreases and saturates
   (B) The mobility of charge carriers increases.
   (C) The Velocity of charge carrier increases.
   (D) None of the above.

3. The action of JFET in its equivalent circuit can be represented by :

   (A) Current controlled current source
   (B) Current controlled voltage source
   (C) Voltage controlled current source
   (D) Voltage controlled voltage source

4. The function $f(t) = -f(t \pm T/2)$ is said to have :

   (A) even symmetry
   (B) odd symmetry
   (C) halfwave symmetry
   (D) quarterwave symmetry

5. The Laplace transform of $e^{\propto t} \cos(\propto t)$ is equal to :

   (A) $\dfrac{s - \propto}{(s - \propto)^2 + \propto^2}$
   (B) $\dfrac{s + \propto}{(s - \propto)^2 + \propto^2}$

   (C) $\dfrac{1}{(s - \propto)^2}$
   (D) $\dfrac{s + \propto}{(s - \propto)^2 - \propto^2}$

6. A heat sink is generally used with a transistor to :

   (A) increase the forward current
   (B) decrease the forward current
   (C) compensate for excessive doping
   (D) prevent excessive temperature rise

7. The 555 timer can be employed in :
   (1) A monostable multivibrator
   (2) A bistable multivibrator
   (3) An astable multivibrator
   Of these statements
   (A) 1 & 2 are correct   (B) 1 & 3 are correct
   (C) 2 & 3 are correct   (D) 1, 2 & 3 are correct

8. A toggle operation is used :
   (A) with a gate circuit   (B) with a flip-flop
   (C) without a flip-flop   (D) with a counter

9. A multiplexer :
   (1) selects one of the several inputs and transmits to a single output
   (2) routes the data from a single input to one of many inputs
   (3) converts parallel data into serial data
   (4) is a combination circuit.
   Of these statements
   (A) 1, 2 & 4 are correct   (B) 2, 3 & 4 are correct
   (C) 1, 3 & 4 are correct   (D) 1, 2 & 3 are correct

10. Intel 8085 supports :
    (A) only isolated input output
    (B) only memory mapped input output
    (C) isolated input output and memory mapped input output
    (D) none of these

11. An I/O processor control the flow of information between :
    (A) Cache memory and I/O devices (B) main memory and I/O devices
    (C) two I/O devices   (D) cache and main memories

12. In 8085, TRAP is :
    (A) always maskable
    (B) cannot interrupt a service subroutine
    (C) used for catastropic events like temporary power failure
    (D) lowest priority interrupt

13. Which of the following is not a high level computer programming language ?
    (A) FORTRAN   (B) MODED
    (C) COBOL   (D) C^{++} language

14. Which microwave tube uses buncher and catcher cavities :

(A) Magnetron
(B) Klystron
(C) Reflex Klystron
(D) Tunneling wave tube

15. When a plane wave propagating through free space, the direction of the field :

(A) $\vec{E}$ is perpendicular to the direction of propagation

(B) $\vec{H}$ is perpendicular to the direction of propagation

(C) $\vec{E}$ is perpendicular to the direction of the field $\vec{H}$.

Which is correct ?

(A) 1 and 2
(B) 2 and 3
(C) 1 and 3
(D) 1, 2 and 3

16. Given a carrier frequency of 100 KHz and a modulating frequency of 5 KHz the band width of AM transmission is :

(A) 5 KHz
(B) 200 KHz
(C) 10 KHz
(D) 20 KHz

17. A PAM signal can be detected by using :

(A) an ADC
(B) an integer
(C) a bandpass filter
(D) a highpass filter

18. Which of the following semiconductor device acts like a diode and two resistor ?

(A) Triac
(B) Diac
(C) SCR
(D) UJT

19. In a thyristor, anode current is made up of :

(A) Electrons only
(B) Holes only
(C) both electrons and holes
(D) none of these

20. A bolometer is used in the measurement of :

(A) speed
(B) high voltage
(C) transmission losses
(D) micro wave power

21. A piezoelectric transducer converts :

(A) Pressure to voltage
(B) Pressure to velocity
(C) force to displacement
(D) vibration to kinetic energy

22. A LVDT has :

(A) one primary coil and two secondary coils

(B) two primary coils and one secondary coil

(C) one primary coil and one secondary coil

(D) two primary coils and two secondary coils

23. A strain gauge is a transducer which will convert :

(A) Pressure into temperature   (B) Pressure into velocity

(C) Pressure into change of resistance (D) force into displacement

24. CMRR (Common Mode Rejection Ratio) for a differential amplifier should be :

(A) Zero   (B) Unity

(C) Small   (D) Large

25. Which of the following diode is used for frequency tuning ?

(A) Varactor diode   (B) Zener diode

(C) Tunnel diode   (D) Gunn diode

26. Match the List-I with List-II :

	List-I		List-II
(a)	BJT	(i)	Pinch off effect
(b)	FET	(ii)	Frequency tuning
(c)	Varactor diode	(iii)	Negative resistance
(d)	Tunnel diode	(iv)	Punch through effect

Codes :

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

27. Match the List-I with List-II :

	List-I		List-II
(a)	Former	(i)	Produces deflecting torque
(b)	Coil	(ii)	Provides base for the coil
(c)	Core	(iii)	Makes the magnetic field radia
(d)	Springs	(iv)	Provides controlling torque

Codes :

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

28. Match the List-I with List-II :

	List-I		List-II
(a)	Passive Network	(i)	Contains electrically separable passive circuit
(b)	Active Network	(ii)	Contains electrically inseparable passive circuit
(c)	Lumped Network	(iii)	Contains circuit elements without energy
(d)	Distributed Network	(iv)	Contains circuit elements with energy sources

Codes :

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

29. Match the List-I with List-II :

	List-I		List-II
(a)	Flip-Flop can be used as latch	(i)	D Flip-Flop
(b)	Flip-Flop can be used as delayed	(ii)	Master-slave
(c)	Flip-Flop does not have race problem	(iii)	JK
(d)	Flip Flop can be used as shift registers	(iv)	RS

Codes :

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

30. Match the List-I with List-II :

      List-I(ADCS)   **List-II (Characteristics)**

(a) Parallel comparator   (i) Null balancing type

(b) Successive approximation   (ii) Faster converter

(c) Dual slope   (iii) Voltage dependent conversion type

(d) Counter type   (iv) Integrating type

Codes :

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

31. Match the List-I with List-II :

      List-I   **List-II**

(a) Frequency modulation   (i) Envelop detection

(b) Double sideband suppressed signal carrier   (ii) Companding

(c) PCM   (iii) Balance modulator

(d) Amplitude modulation   (iv) Pre-emphasis and de emphasis

Codes :

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

32. Match the List-I with List-II :

      List-I   **List-II**

(a) RC coupling   (i) High voltage gain and impedance matching

(b) Inductive coupling   (ii) Ability to amplify dc and low frequency signals

(c) Transformer coupling   (iii) Minimum possible non-linear distortion

(d) Direct coupling   (iv) Low collector supply voltage can be used

Codes :

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

33. Match the List-I with List-II :

	List-I		List-II
(a)	LASER	(i)	Emits light of low intensity
(b)	Solar cell	(ii)	Converts light energy into electrical energy
(c)	Photo diode	(iii)	Deliver powers to load
(d)	LED	(iv)	Emits light of high intensity

Codes :

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

34. Match the List-I with List-II :

	List-I		List-II
(a)	Single mode optical fiber	(i)	data rate is highest
(b)	Multi mode optical fiber	(ii)	data rate is medium
(c)	Graded index optical fiber	(iii)	data rate is lowest
(d)	Simple glass rod optical fiber	(iv)	data transfer not possible

Codes :

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

35. Match the List-I with List-II :

	List-I		List-II
(a)	LVDT	(i)	Pressure
(b)	Bourdon gauge	(ii)	Temperature
(c)	Strain gauge	(iii)	Displacement
(d)	Thermistor	(iv)	Stress

Codes :

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

Assertion - Reason type questions :

From the following four options, select the correct one

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

(B) Both **(A)** and **(R)** true but **(R)** is not the correct explanation of **(A)**

(C) **(A)** is true but **(R)** is false

(D) **(A)** is false but **(R)** is true

36. **Assertion (A) :** If a semiconductor is placed in a transverse magnetic field $\vec{B}$ and an electric field $\vec{E}$ is applied across its other two faces, then it would produce an electric current $\vec{I}$ in the direction perpendicular to both $\vec{B}$ and $\vec{E}$

   Reason (R) : Hall coefficient is proportional to the mobility of charge carriers in the semi conductor.

37. **Assertion (A) :** The Wein bridge can be used for frequency measurement.

   Reason (R) : The Wein bridge uses only capacitors and resistors.

38. **Assertion (A) :** R-2R ladder type D/A converter has a higher speed of conversion than a weighted resistance D/A convertor.

   Reason (R) : R-2R ladder type D/A converter uses a smaller number of components than the weighted resistance D/A converter.

39. **Assertion (A) :** Bistable multivibrator can be used as flip flop

   Reason (R) : It has two stable states

40. **Assertion (A) :** Reflex klystron is made up of a single cavity

   Reason (R) : Velocity modulation occurs in the cavity

41. **Assertion (A) :** Optical fibers have broader bandwidth to conventional copper cables

   Reason (R) : The information carrying capacity of optical fibers is limited by Rayleigh scattering loss.

42. **Assertion (A) :** A monostable multivibrator can be used to alter the pulse width of a repetitive pulse train.

   Reason (R) : Monostable multivibrator has a single stable state

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

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

44. **Assertion (A) :** A half-adder is faster than full adder

   Reason (R) : A half adder gives only one output while a full adder gives two outputs

45. **Assertion (A) :** Stimulated emission is the key to the operation of LASER

   Reason (R) : An important property of LASER radiation is its coherence, under which is meant the correlation between the phases of oscillation at different positions in space and at various moments of time

LINKED ITEMS

[Read the passage below and answer the questions that follow based on your understanding of the passage]

Michael Faraday was one of the greatest of all scientific researchers. In 1845 he observed experimentally a relationship between electromagnetism and light. Twenty years later James Clerk Maxwell published "A Dynamical theory of the Electro-magnetic field". Starting with four basic relationship known as Maxwell's equations, he proved mathematically that electromagnetic waves could propagate through a nonconducting medium. He predicted a value of wave velocity. In early 1880 s Heinrich Hertz succeeded in verifying Maxwell's theory of electromagnetic wave through a brilliant series of experiments.

The first application of electromagnetic waves was in the field of communications. The major contribution in this respect came from Sir Jagdish Chandra Bose of Calcutta, India and Guglielmo Marconi of Italy around 1895. Sir Jagadish Chandra Bose more than a century ago generated millimeter wave by using Galena detector. With the invention of telegraphy by Samuel Morse in 1844 and telephone by Bell and Gray in 1876, a more detailed study of electrical signals on transmission lines was needed. Thanks to the pioneering work of Barkhausin and Kurz on positive-grid oscillators (1919), and Hull on smooth-bore magnetron (1921), reliable microwave sources became a reality. A tube with 20 watts output at 3 GHz was constructed by British Scientists in 1936. A year later, the Varlan brothers at Stanford conceived the idea of velocity modulation of an electron beam. Microwave tube development in the forms of travelling wave tube and Reflex Klystron in 1930 s was given great impetus by the threatening war clouds over Europe precipitated by events surrounding world war II.

The early 1960 s saw the emergence of Microwave integrated circuits and solid state microwave sources. The pioneering efforts of J.B. Gunn, W.T.Read, B.C. Deloach and many others led to the successful development of Gunn effect and Impatt type

oscillators. Gunn diode is based on Gunn effect and an useful microwave source of power in the frequency range of 1 GHz to 30 GHz. Gunn diode exibits NDM due to transferred electron effect. With the development of satellite communication, microwave relay stations and further growth in commercial and military radars, microwave technology turned out to be billion-dollar industry. The International MTT symposium and the Transactions of the MTT are the major sources of information on development in the theory and practice of microwave engineering.

46. Four basic relationships known as Maxwall's equation do not contain the following law :

(A) Gauss law

(B) Ampere's law

(C) Faraday's law

(D) Non existance of magnetic monopoles

47. Microwave frequency extends from :

(A) 0.1 GHz to 100 GHz

(B) 1 GHz to 30 GHz

(C) 1 GHz to 300 GHz

(D) 50 MHz to 1000 GHz

48. Millimeter wave was demonstrated by Sir J.C Bose using a solid state detector. This detector was made of :

(A) Silicon

(B) Germanium

(C) Galena

(D) Carbon

49. The idea of velocity modulation of an electron beam was used to construct :

(A) Gunn diode

(B) Reflex klystron

(C) Magnetron

(D) Carcinotron

50. Gunn diode is based on :

(A) Impact ionization and avalanche multiplication effect

(B) Transferred electron effect

(C) Velocity modulation effect

(D) Current modulation effect

- o O o -

Space For Rough Work