Signature and Name of Invigilator

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

1. (Signature) _____

(Name) _____

Roll No. | | | | | | |

(In figures as per admission card)

2. (Signature) _____

(Name) _____

Roll No. _____

(In words)

Test Booklet No.

J–8807	**PAPER—II**	
Time : 1¼ hours]	**ELECTRONIC SCIENCE**	[Maximum Marks : 100

Number of Pages in this Booklet : **16**   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.

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 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.

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.

  Example : (A) (B) ● (D)

  where (C) is the correct response.

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.

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 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.

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.

10. **Use only Blue/Black Ball point pen.**

11. **Use of any calculator or log table etc., is prohibited.**

12. **There is NO negative marking.**

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 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) 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. 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।

  उदाहरण : (A) (B) ● (D)

  जबकि (C) सही उत्तर है।

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 है, 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 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. 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. केवल नीले/काले बाल प्वाईंट पैन का ही इस्तेमाल करें।

11. किसी भी प्रकार का संगणक (कैलकुलेटर) या लाग टेबल आदि का प्रयोग वर्जित है।

12. गलत उत्तर के लिए अंक नहीं काटे जायेंगे।

ELECTRONIC SCIENCE

PAPER—II

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

1. Monolithic transistors are formed in the epitaxial n-layer :
   (A) by oxidation process
   (B) by evaporation process
   (C) by successive impurity diffusions
   (D) in open operation

2. The most popular form of IC package is :
   (A) TO-5
   (B) DIL
   (C) Flat pack
   (D) Disc pack

3. A unit ramp function when integrated yields :
   (A) unit parabolic function
   (B) unit ramp function
   (C) unit doublet
   (D) unit impulse function

4. The frequency range between two half power frequencies is termed as :
   (A) damping coefficient
   (B) selectivity
   (C) bandwidth
   (D) cut-off

5. Bootstrap is concerned with :
   (A) Darlington connection
   (B) Multistage amplifier
   (C) Current controlled current source
   (D) Cascode connection

6. The 4 - bit group that is used in excess - 3 code is :

(A)   0001

(B)   0011

(C)   0010

(D)   1110

7. In T flip flop, Q becomes $\overline{Q}$ when its input is :

(A)   0 or 1

(B)   0

(C)   1

(D)   0 and 1

8. Transistor amplifier configuration which simultaneously provides high current as well as voltage gain is :

(A)   CC

(B)   CB

(C)   CE

(D)   CC and CB

9. The minimum length for the transmitting antenna of a radio station whose frequency is 1080 kHz will be :

(A)   277.7m

(B)   27.77m

(C)   6.944m

(D)   69.44m

10. If the peak transmitted power in a Radar system is increased by a factor of 81, the maximum range increased by a factor of :

(A)   3

(B)   9

(C)   81

(D)   6

11. The input power factor of a cyclo converter is :

(A) high

(B) low

(C) always equal to unity

(D) leading

12. A clipper :

(A) removes part of the input signal

(B) modifies the shape of the input signal

(C) increases DC value of the input signal

(D) reduces DC value of the input signal

13. The carrier oscillator of a directly modulated FM transmitter generates a :

(A) sine wave

(B) triangular wave

(C) ramp wave

(D) pulse

14. Pre-emphasis and de-emphasis circuits are used to :

(A) make the voice sound clearer

(B) increase the percentage of modulation

(C) increase the modulation index

(D) improve S/N ratio at the receiver

15. Feedback control systems are :

(A) low pass filters

(B) high pass filters

(C) band pass filters

(D) band reject filters

16. The effect of adding poles and zeros can be studied quickly for determining phase and gain margin from :

(A) Nicholas plot

(B) Bode plot

(C) Magnitude versus phase plot

(D) Nyquist plot

17. In computer technology, 1M byte memory means :

(A) 10 00 000 bytes

(B) 10 00 024 bytes

(C) 10 24 000 bytes

(D) 10 48 576 bytes

18. An instruction register is a storage for :

(A) location of data in memory

(B) location of instruction in memory

(C) binary code for the operation to be performed

(D) address of the next instruction to be executed

19. An active low signal INTA is not needed from microprocessor to service which of the following interrupt requests ?

(A) TRAP

(B) INTR

(C) RST 7.5

(D) RST 5.5

20. The address bus of Intel 8085 is 16 bit wide and hence the memory which can be accessed by this address bus is :

(A) 2 k bytes

(B) 4 k bytes

(C) 10 k bytes

(D) 64 k bytes

(Questions 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 (R) is a correct explanation of the Assertion (A). 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)** : In intrinsic semi-conductors, the resistivity decreases with the increase in temperature.

   Reason (R) : The increased vibrations of the atoms in the crystal causes increased hinderance to the current flow.

22. **Assertion (A)** : A three-phase wattmeter requires only two current coils and two pressure coils

   Reason (R) : If power is measured in two phases, the power in the third phase could be easily calculated.

23. **Assertion (A)** : A single conductor waveguide having a simple connected contour and homogeneously filled with a non-magnetic dielectric cannot support TEM wave.

   Reason (R) : If a TEM wave is assumed to exist within a single conductor waveguide having a simply connected contour and homogeneously filled with a non-magnetic dielectric, it would violate Maxwell's equations.

24. **Assertion (A)** : The basic operation of a microprocessor consists of fetching and execution of instructions one by one.

   Reason (R) : The instructions set of a microprocessor is stored inside the ALU.

25. **Assertion (A)** : When the forward gain of a control system is increased, the transient response of the system becomes oscillatory.

   Reason (R) : Increasing the forward gain reduces the steady-state error.

26. **Assertion (A)** : The root locus for any control system is symmetrical about the real axis.

   Reason (R) : For all polynomial equations with real coefficients, complex roots occur in conjugate pairs.

6

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

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

28. **Assertion (A)** : The topdown structured programming should be used for developing programmes.

Reason (R) : The topdown structured programming methodology enables us to get readable and easily provable programs.

29. **Assertion (A)** : A demultiplexer can be used as a decoder.

Reason (R) : A demultiplexer is built using NAND gates only.

30. **Assertion (A)** : LASER is a low-noise optical source.

Reason (R) : LASER operation is carried out at cryogenic temperatures.

31. Measurement of a non-electrical quantity involves the following four subsystems :

(i)   Amplifier block

(ii) Display block

(iii) Instrumentation block

(iv) Transducer block

The correct sequence in which these blocks occur is :

(A) (iv)   (i)   (iii)   (ii)

(B) (iv)   (ii)   (i)   (iii)

(C) (i)   (iii) (ii)   (iv)

(D) (i)   (ii)   (iii)   (iv)

32. The following bands are used to identify the microwave frequency range 1G Hz to 26 GHz :

(i)   K

(ii) L

(iii) S

(iv) X

The correct sequence from lower frequency band to higher frequency band is :

(A) (i)   (iv)   (iii)   (ii)

(B) (ii)   (i)   (iii)   (iv)

(C) (ii)   (iii) (iv)   (i)

(D) (ii)   (iv)   (i)   (iii)

33. The following semiconductors materials :

(i) Si

(ii) Ge

(iii) GaAS

(iv) InP

The correct sequence in increasing order of the majority carrier charge mobility is :

(A) (i) (ii) (iii) (iv)

(B) (iv) (i) (ii) (iii)

(C) (i) (ii) (iv) (iii)

(D) (i) (iv) (ii) (iii)

34. The digital computer data storage media :

(i) Hard disk

(ii) Computer disk

(iii) RAM

(iv) Cache memory

The correct sequence for the above media, the digital data storage speed in descending order :

(A) (ii) (i) (iii) (iv)

(B) (i) (ii) (iii) (iv)

(C) (iv) (iii) (ii) (i)

(D) (iv) (iii) (i) (ii)

35. The semiconductor devices :

(i) Tunnel diode

(ii) FET

(iii) BJT

(iv) IMPATT

The correct sequence of their inherent operating frequency in the increasing order is :

(A) (ii) (iii) (i) (iv)

(B) (iii) (ii) (i) (iv)

(C) (ii) (i) (iii) (iv)

(D) (i) (iv) (iii) (ii)

36. Match **List - I** with **List - II** and select the correct answer using the codes given below the list :

	List - I		*List - II*
(a)	Value of Inductance	(i)	$\rho \cdot \dfrac{\ell}{a}$
(b)	Power factor	(ii)	$\dfrac{\omega L}{r}$
(c)	Q factor	(iii)	$\dfrac{r}{\omega L}$
(d)	Value of Resistance	(iv)	$F \cdot n^2 \cdot d$

Codes :

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

37. Match **List - I** with **List - II** and select the correct answers using the codes given below the list :

	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)

38. Match **List - I** with **List - II** and select the correct answer using the codes given below the list :

	List - I		List - II
	(*Maximum Efficiency in percent*)		(*Amplifier*)
(a)	25	(i)	Class - B transformer-coupled
(b)	78.5	(ii)	Class - A RC-coupled
(c)	100	(iii)	Class - A transformer-coupled
(d)	50	(iv)	Class - D switching mode

Codes :

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

39. Match **List - I** with **List - II** and select the correct answer using the codes given below the list :

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

Codes :

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

40. Match **List - I** with **List - II** and select the correct answer using the codes given below the list :

	List - I		List - II
(a)	Conducting material	(i)	Alumina
(b)	Semi-conducting material	(ii)	Platinum
(c)	Ferro-electric material	(iii)	Silicon
(d)	Insulating material	(iv)	Barium Titanate

Codes :

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

41. Match **List - I** with **List - II** and select the correct answer using the codes given below the list :

	List - I		List - II
(a)	Ampere's law	(i)	$\nabla \times H = J + \dfrac{\partial D}{\partial t}$
(b)	Faraday's law	(ii)	$\nabla . D = \rho$
(c)	Gauss' law for electric field	(iii)	$\nabla . B = 0$
(d)	Gauss' law for magnetic field	(iv)	$\nabla \times E = -\dfrac{\partial B}{\partial t}$

Codes :

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

42. Match **List - I** with **List - II** and select the correct answer using the codes given below the list :

	List - I		List - II
(a)	Crystal Oscillator	(i)	Local Oscillator
(b)	Reflex klystron	(ii)	Narrow-band Oscillator
(c)	Saw-tooth generator	(iii)	Microwave Oscillator
(d)	IF amplifier	(iv)	Mixer

Codes :

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

43. Match **List - I** with **List - II** and select the correct answer using the codes given below the list :

	List - I		List - II
(a)	8086	(i)	8 - bit processor
(b)	8085	(ii)	Interface chip
(c)	8255	(iii)	16 - bit processor
(d)	80486	(iv)	64 - bit processor

Codes :

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

44. Match **List - I** with **List - II** and select the correct answer using the codes given below the list :

	List - I			List - II
(a)	Linearity		(i)	Superposition Theorem
(b)	Structure		(ii)	Norton's Theorem
(c)	Equivalent circuit		(iii)	Tellegan's Theorem
(d)	Bilateral		(iv)	Reciprocity Theorem

Codes :

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

45. Match **List - I** with **List - II** and select the correct answer using the codes given below the list :

	List - I			List - II
(a)	Frequency modulation		(i)	Envelope detection
(b)	Double sided suppressed signal carrier		(ii)	Companding
(c)	PCM		(iii)	Balanced modulation
(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)

Para Phrasing (Read the paragraph and answer the questions 46 to 50) :

The reflex klystron is a low-power, low frequency, microwave oscillator. It has an electron gun which produces an electron beam. Since, the device is short in length, it does not require a focussing structure to counteract the inter-electron repulsive forces. The electron beam is accelerated toward the cavity, which has a high positive voltage applied to it and acts as the anode. The electrons overshoot the gap in this cavity and continue on to the next electrode, which they never reach. This repeller electrode has a fairly high negative voltage applied to it, and care is taken to ensure that it is not bombarded by the electrons. Accordingly, electrons in the beam reach some point in the interaction space and are then turned back due to repeller voltage, eventually to be dissipated in the anode cavity.

As the electrons having a uniform velocity pass through the cavity (RF) gap, the RF waves which are sinusoidally time varying in nature gets superimposed on the DC field and due to which the electron beam gets velocity modulated. As the velocity modulated electron beam travels in the interaction gap, it gets converted into density modulation, resulting the formation of electron bunches.

A positive feedback is obtained by reflecting the velocity modulated electrons back to the cavity gap. The return of the electrons is achieved by the repeller electrode at a voltage below that of the cathode of the electron gun. For optimum feedback, the cavity to repeller voltage should be such that the electron spreads over the half cycle of oscillation leaving the RF cavity gap with differing velocities return back to the gap in the form of the bunches.

If the repeller voltage is properly adjusted, the returning electrons give its energy to the gap than they took from it on the forward journey and continuous oscillation takes place.

46. A reflex klystron functions as :
    (A) microwave amplifier
    (B) microwave mixer
    (C) microwave oscillator
    (D) both as microwave amplifier and oscillator

47. In reflex klystron, velocity modulation takes place in :
    (A) Drift tube
    (B) Interaction gap
    (C) Collector
    (D) RF cavity

48. The purpose of cathode in microwave tubes is :

(A)   to produce electrons

(B)   to collect electrons

(C)   to reduce electrons

(D)   to increase electrons

49. The transit time in the repeller space of a reflex klystron must be $n+\dfrac{3}{4}$ cycles to ensure that :

(A)   electrons are accelerated by the gap voltage on their return.

(B)   returning electrons give energy to the gap oscillations.

(C)   it is equal to the period of the cavity oscillations.

(D)   the repeller is not damaged by striking electrons.

50. The focussing structure is used in microwave tubes to :

(A)   produce electron beam.

(B)   counter the inter-electron repulsive forces.

(C)   protect RF cavity

(D)   protect repeller electrode

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Space For Rough Work