

Signature and Name of Invigilator

- 1. (Signature) _____
(Name) _____
- 2. (Signature) _____
(Name) _____

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

Roll No.

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(In figures as per admission card)

Roll No. _____
(In words)

Test Booklet No.

D-8805

PAPER – II

Time : 1¼ hours]

ELECTRONIC SCIENCE

[Maximum Marks : 100

Number of Pages in this Booklet : 12

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 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)	(C)	(D)
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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.

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 चेक 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 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)	(C)	(D)
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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 चिन्हंकित 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 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 प्वाइंट पेन 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.

- The threshold voltage of an n-channel MOSFET can be increased by :
 - increasing the channel dopoint concentration
 - decreasing the channel dopoint concentration
 - reducing the gate oxide thickness
 - reducing the channel length
- The potential difference between two points can be expressed as :
 - Volt per meter
 - Watt per ampere
 - Coulomb per Newton
 - Volt per ampere
- Laplace transform of $e^{-at} \sin wt$ is :
 - $\frac{w}{(s+a)^2 + w^2}$
 - $\frac{w}{(s-a)^2 + w^2}$
 - $\frac{w}{(s-a)^2 - w^2}$
 - $\frac{w}{(s+a)^2 - w^2}$
- In a linear network the ratio of voltage excitation to current response is unaltered when position of excitation and response are interchanged. This assertion stems from :
 - principle of duality
 - principle of superposition
 - reciprocity theorem
 - equivalent theorem
- The bandwidth of an amplifier can be increased by :
 - decreasing the capacitance of its bypass filter
 - increasing input signal frequency
 - cascading it
 - minimising its stray capacitance
- Without the DC source, a clipper acts like a :
 - rectifier
 - clammer
 - demodulator
 - chopper

7. In order to build a mod-6 counter using three flip-flops the number of possible count sequence is :
(A) 4 (B) 8 (C) 16 (D) 28
8. The content of a 4-bit register is 1101. The register is shifted 6 times to the right with serial input being 101101. The final content of the register will be :
(A) 1011 (B) 0010 (C) 1010 (D) 0111
9. A microprocessor with a 16-bit address bus is used in linear memory selection configuration with 4 memory chips, the maximum addressable memory space is :
(A) 64 k (B) 16 k (C) 8 k (D) 4 k
10. The interface chip used for data transmission between 8086 and 16 bit ADC is :
(A) 8259 (B) 8255 (C) 8253 (D) 8251
11. The FORTRAN statement $A = 2.5, J = 5 * A - 2 ** 4 / 2$ will calculate J as :
(A) 12 (B) 8.5 (C) 4.5 (D) 4
12. A pointer is a variable that contains as its value :
(A) the dimension of another variable
(B) the address of another variable
(C) the size of another variable
(D) the value of another variable
13. An electromagnetic wave travels in free space with electric field component
$$\vec{E} = 100e^{j(0.866y + 0.5z)} \hat{x} \text{ V/m}$$

Its angular frequency, ω , is :
(A) $3 \times 10^8 \text{ m/s}$ (B) $3 \times 10^8 \text{ rad/s}$ (C) $1.5 \times 10^8 \text{ rad/s}$ (D) 10^8 rad/s
14. The behaviour of which of the following devices is governed by bulk effect :
(A) Gunn diode (B) PIN diode
(C) Tunnel diode (D) IMPATT diode

15. A frequency modulated signal is expressed as :
- (A) $A \cos [w_c t + K m(t)]$ (B) $A \cos [w_c t + \phi]$
(C) $A \cos (w_c t)$ (D) $A \cos [w_c t + K \int_0^t m(\lambda) d\lambda]$
16. In PCM system if the quantisation levels are increased from 2 to 8, the relative bandwidth requirement will :
- (A) become four times (B) remain same
(C) be tripled (D) be doubled
17. Optical communication systems generally use :
- (A) amplitude modulation (B) frequency modulation
(C) phase modulation (D) intensity modulation
18. A device that exhibits a negative resistance region is :
- (A) p-n diode (B) UJT (C) JFET (D) BJT
19. A pyrometer is used to measure :
- (A) temperature (B) pressure (C) light intensity (D) low currents
20. A linear discrete-time system has the characteristic equation $z^3 - 0.81z = 0$. The system :
- (A) is stable (B) is marginally stable
(C) is unstable (D) stability cannot be assessed

(Question No. 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 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 but (R) is false
(D) (A) is false but (R) is true
21. **Assertion (A) :** At high temperature, the avalanche breakdown voltage is higher.
Reason (R) : At higher temperature mean free paths of electrons and holes are shorter, therefore a larger field is required to cause ionisation.

22. **Assertion (A)** : The Wien Bridge can be used for frequency measurements.
Reason (R) : The Wien Bridge uses only capacitors and resistors.
23. **Assertion (A)** : A demultiplexer cannot be used as a decoder.
Reason (R) : A demultiplexer is built using AND gates only.
24. **Assertion (A)** : In Intel 8085, the lower byte of address and data are multiplexed.
Reason (R) : This helps limit the number of external pin terminals.
25. **Assertion (A)** : The solution of Poisson equation is the same as the solution of Laplace equation.
Reason (R) : The Laplace equation is the same as Poisson equation for source free region.
26. **Assertion (A)** : The total emf induced in a circuit equals the time rate of change of the total magnetic flux linking the circuit.
Reason (R) : The induced current in a loop is always so directed as to produce a flux opposing the change in the flux density.
27. **Assertion (A)** : AM has better noise performance than FM.
Reason (R) : AM results in increase in signal power.
28. **Assertion (A)** : Optical communication has shifted from $1.3 \mu\text{m}$ to $1.55 \mu\text{m}$ in silica fibers.
Reason (R) : Dispersion and attenuation are both minimum at $1.55 \mu\text{m}$.
29. **Assertion (A)** : Thyristors are preferred to power diodes in variable power rectifiers.
Reason (R) : Thyristors provide controlled rectification and also power loss in them is less compared to that in power diodes.
30. **Assertion (A)** : An important property of laser radiation is its coherence.
Reason (R) : Stimulated emission is the key to the operation of LASER.

31. Consider the following semiconductor diodes :

1. Germanium diode
2. Silicon diode
3. Tunnel diode
4. Schottky diode

The correct increasing order of forward voltage drop of the above diodes is :

- (A) 1, 3, 4, 2 (B) 1, 2, 3, 4 (C) 3, 4, 2, 1 (D) 3, 1, 4, 2

32. In the microwave region some of the band designations are Ku, X, K and Ka. The order according to their allocated frequency band is :

- (A) Ku, X, K, Ka (B) X, Ku, K, Ka
(C) Ka, Ku, K, X (D) K, X, Ku, Ka

33. Consider the Analog to Digital converters given below :

1. Successive approximation ADC
2. Dual Ramp ADC
3. Counter method ADC
4. Simultaneous ADC

The correct sequence of the ascending order in terms of conversion times of the above ADC's is :

- (A) 3, 2, 4, 1 (B) 2, 3, 4, 1 (C) 2, 3, 1, 4 (D) 3, 2, 1, 4

34. The various subsystems in an FM receiver are arranged as :

1. Mixer, RF amplifier, limiter, IF amplifier, discriminator, audio amplifier
2. RF amplifier, mixer, IF amplifier, limiter, discriminator, audio amplifier
3. RF amplifier, mixer, limiter, discriminator, IF amplifier, audio amplifier
4. Mixer, IF amplifier, limiter, audio amplifier, discriminator, RF amplifier

The correct sequence of subsystems is :

- (A) 1 (B) 2 (C) 3 (D) 4

35. Four main types of telephone exchanges available in India are :

1. Manual
2. Electronic
3. Strowger
4. Cross-bar

The correct order in which they appeared in our country is :

- (A) 1, 2, 3, 4 (B) 2, 1, 4, 3 (C) 1, 3, 4, 2 (D) 1, 4, 3, 2

(Q.No. 36 to 45) : In the following questions Match List - I with List - II and select the correct answer using the codes given below the lists.

- | | | |
|------------|-----------------|---------------------------|
| 36. | List - I | List - II |
| (a) | BJT | (i) Negative resistance |
| (b) | MOSFET | (ii) High current gain |
| (c) | Tunnel Diode | (iii) Voltage regulation |
| (d) | Zener Diode | (iv) High input impedance |

Code : (a) (b) (c) (d)

- | | | | | |
|-----|-------|-------|-------|-------|
| (A) | (i) | (ii) | (iii) | (iv) |
| (B) | (ii) | (iv) | (i) | (iii) |
| (C) | (iv) | (iii) | (ii) | (i) |
| (D) | (iii) | (i) | (ii) | (iv) |

- | | | |
|------------|--------------------|---------------------------|
| 37. | 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) Reciprocal theorem |

Code : (a) (b) (c) (d)

- | | | | | |
|-----|-------|-------|-------|-------|
| (A) | (iii) | (ii) | (iv) | (i) |
| (B) | (iv) | (i) | (ii) | (iii) |
| (C) | (i) | (ii) | (iii) | (iv) |
| (D) | (i) | (iii) | (ii) | (iv) |

38. List - I

- (a) Wien Bridge
- (b) Colpitt
- (c) Hartley
- (d) Clapp

Code : (a) (b) (c) (d)

- (A) (i) (ii) (iii) (iv)
- (B) (iv) (iii) (ii) (i)
- (C) (ii) (iii) (iv) (i)
- (D) (iii) (iv) (i) (ii)

List - II

- (i) RF Oscillator : 2 inductance and 1 capacitance
- (ii) LC Oscillator for RF : 3 capacitance and 1 inductance
- (iii) RC Oscillator for audio frequency
- (iv) RF Oscillator : 2 capacitance and 1 inductance

39. List - I

- (a) Multiplexer
- (b) Demultiplexer
- (c) Shift Register
- (d) Encoder

Code : (a) (b) (c) (d)

- (A) (i) (ii) (iii) (iv)
- (B) (iv) (iii) (ii) (i)
- (C) (iii) (iv) (i) (ii)
- (D) (ii) (i) (iv) (iii)

List - II

- (i) Sequential memory
- (ii) Converts decimal to binary
- (iii) Data selector
- (iv) Routes out many data output with single input

40. List - I

- (a) Sign flag
- (b) Zero flag
- (c) Parity flag
- (d) Carry flag

Code : (a) (b) (c) (d)

- (A) (ii) (i) (iv) (iii)
- (B) (i) (ii) (iii) (iv)
- (C) (iv) (ii) (i) (iii)
- (D) (iii) (iv) (i) (ii)

List - II

- (i) 7th bit
- (ii) 8th bit
- (iii) 1 bit
- (iv) 3rd bit

41. List - I

- (a) Pointer
- (b) Dimension
- (c) Header
- (d) FLOAT

List - II

- (i) C - Program
- (ii) Array
- (iii) Real variable
- (iv) Memory address

Code : (a) (b) (c) (d)

- (A) (i) (ii) (iii) (iv)
- (B) (iv) (ii) (i) (iii)
- (C) (iii) (iv) (i) (ii)
- (D) (ii) (i) (iv) (iii)

42. List - I

- (a) $\nabla \times \vec{H} = \vec{J} + \dot{\vec{D}}$
- (b) $\nabla \times \vec{E} = -\dot{\vec{B}}$
- (c) $\nabla \cdot \vec{D} = 0$
- (d) $\nabla \cdot \vec{B} = 0$

List - II

- (i) Gauss' Law for electric field
- (ii) Ampere's Law
- (iii) Faraday's Law
- (iv) Gauss' Law for magnetic field

Code : (a) (b) (c) (d)

- (A) (i) (ii) (iii) (iv)
- (B) (iv) (i) (iii) (ii)
- (C) (iii) (iv) (ii) (i)
- (D) (ii) (iii) (i) (iv)

43. List - I

- (a) AM Broadcast
- (b) FM Broadcast
- (c) TV Broadcast
- (d) Point to Point

Code : (a) (b) (c) (d)

- (A) (i) (ii) (iii) (iv)
- (B) (iii) (iv) (ii) (i)
- (C) (ii) (iv) (iii) (i)
- (D) (i) (iii) (iv) (ii)

List - II

- (i) Multipath phenomenon
- (ii) 535 - 1600 KHz
- (iii) VSB modulation
- (iv) 88 - 108 MHz

44. List - I

- (a) LVDT
- (b) Bourdon gauge
- (c) Strain gauge
- (d) Thermistor

Code : (a) (b) (c) (d)

- (A) (i) (ii) (iii) (iv)
- (B) (iii) (i) (iv) (ii)
- (C) (iv) (i) (iii) (ii)
- (D) (ii) (i) (iv) (iii)

List - II

- (i) Pressure
- (ii) Temperature
- (iii) Displacement
- (iv) Stress

45. List - I

- (a) Polarisation
- (b) Coherence
- (c) Total internal reflection
- (d) Dispersion

Code : (a) (b) (c) (d)

- (A) (ii) (iii) (iv) (i)
- (B) (i) (ii) (iii) (iv)
- (C) (iv) (iii) (ii) (i)
- (D) (ii) (i) (iii) (iv)

List - II

- (i) Bandwidth
- (ii) LCD
- (iii) Laser
- (iv) Optical fiber

Para phrasing (Read the paragraph and answer the question nos. 46 to 50) :

In 1900 Planck proposed, in order to explain the distribution of energy in the spectrum of black body, that an oscillating electron may not radiate or absorb energy continuously, as required by classical electrodynamics, but only in integral multiples of a fundamental unit called quantum. If f is the frequency of radiation, the energy of a quantum is given by $E = hf$ where h is a constant known as Planck's constant.

In 1905, Einstein went further and suggested that light, or electromagnetic radiation in general, might sometimes be regarded having a corpuscular or particle like nature. The light particles, or quanta, are called photons. Photons are peculiar in that they travel with the speed of light and have zero rest mass.

What is important to notice is that light can be thought of either as waves with particle like properties or as particles with wave like properties. In 1924 de Broglie generalised the idea and suggested that any moving particle with mass m and speed v , will in some experiments display wave - like properties with wavelength $\lambda = h/mv$.

46. A quantum of visible light is called :
(A) Photon (B) Proton (C) Hyperon (D) Phonon
47. A quantum will have more energy if :
(A) the wavelength is longer (B) the frequency is higher
(C) the amplitude is higher (D) the velocity is greater
48. A photon has its velocity in vacuum equal to :
(A) 3×10^9 cm/sec (B) 3×10^{10} cm/sec
(C) 3×10^{10} km/sec (D) 9×10^{10} cm/sec
49. For an electron (mass = 9.1×10^{-28} gm) moving with a speed of 5.9×10^8 cm/sec, the accompanying wave will have a wavelength of :
(A) 1.2×10^{-8} cm (B) 1.2×10^{-10} cm
(C) 1.2×10^{-6} cm (D) 1.2×10^{-12} cm
50. The electron microscope works on the basis of :
(A) refraction of light in lenses
(B) wave - like properties of electron in motion
(C) pressure exerted by electron beam
(D) production of electromagnetic waves by impact of electrons on matter.

- o O o -

Space For Rough Work

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