

Signature and Name of Invigilator

1. (Signature) _____

(Name) _____

2. (Signature) _____

(Name) _____

OMR 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.

J-8809

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

- Write your roll number in the space provided on the top of this page.
- This paper consists of fifty multiple-choice type of questions.
- 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 :
 - 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.
 - 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.**
 - After this verification is over, the Test Booklet Number should be entered in the OMR Sheet and the OMR Sheet Number should be entered on this Test Booklet.
- 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.
- 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.
- Read instructions given inside carefully.
- Rough Work is to be done in the end of this booklet.
- 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.
- You have to return the test question booklet and OMR Answer Sheet to the invigilators at the end of the examination compulsorily and must not carry it with you outside the Examination Hall.
- Use only Blue/Black Ball point pen.
- Use of any calculator or log table etc., is prohibited.
- There is NO negative marking.

परीक्षार्थियों के लिए निर्देश

- पहले पृष्ठ के ऊपर नियत स्थान पर अपना रोल नम्बर लिखिए।
- इस प्रश्न-पत्र में पचास बहुविकल्पीय प्रश्न हैं।
- 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 :
 - 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।
 - 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।**
 - इस जाँच के बाद प्रश्न-पुस्तिका की क्रम संख्या OMR पत्रक पर अंकित करें और OMR पत्रक की क्रम संख्या इस प्रश्न-पुस्तिका पर अंकित कर दें।
- 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।
- 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 चिह्नित करते हैं, तो उसका मूल्यांकन नहीं होगा।
- अन्दर दिये गये निर्देशों को ध्यानपूर्वक पढ़ें।
- कच्चा काम (Rough Work) इस पुस्तिका के अन्तिम पृष्ठ पर करें।
- 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।
- आपको परीक्षा समाप्त होने पर प्रश्न-पुस्तिका एवं OMR उत्तर-पत्रक निरीक्षक महोदय को लौटाना आवश्यक है और परीक्षा समाप्ति के बाद उसे अपने साथ परीक्षा भवन से बाहर न लेकर जायें।
- केवल नीले/काले बाल प्वाइंट पेन का ही इस्तेमाल करें।**
- किसी भी प्रकार का संगणक (कैलकुलेटर) या लागू टेबल आदि का प्रयोग वर्जित है।
- 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. When the rms output voltage of the bridge full-wave rectifier is 20 V the PIV across the diode is :

- (A) 28.2 (B) 19.3 (C) 40 (D) 31.42

2. When a Si transistor is in saturation mode the V_{CESAT} is :

- (A) 5 V (B) 0.3 V (C) 1 V (D) 0 V

3. For a two part reciprocal network, the output open-circuit voltage divided by the input current is equal to :

- (A) B (B) Z_{12} (C) $\frac{1}{y_{12}}$ (D) h_{12}

4. The Laplace transform of $(tsint)$ is :

- (A) $\frac{2}{(s^2 + 1)^2}$ (B) $\frac{2s}{(s^2 + 1)^2}$
(C) $\frac{s}{(s^2 + 1)^2}$ (D) $\frac{2s}{(s^2 - 1)^2}$

5. For step input the output of an integrator is :

- (A) a pulse (B) a triangular wave form
(C) a spike (D) a ramp

6. Two ideal FETs each characterized by the parameters g_m and r_d are connected in parallel. The composite FET is characterized by :
- (A) $g_m/2$ and $2r_d$ (B) $g_m/2$ and $2r_d/2$
- (C) $2g_m$ and $r_d/2$ (D) $2g_m$ and $2r_d$
7. A 3-Variable Karnaugh map has :
- (A) eight cells (B) three cells (C) sixteen cells (D) four cells
8. The number of comparators in a parallel convertor type 8-bit A to D convertor :
- (A) 8 (B) 16 (C) 256 (D) 255
9. The jump address of RST2 instruction in 8085 is :
- (A) 0000H (B) 0008H (C) 0010H (D) 0018H
10. Which I/O port of 8051 does not have dual function ?
- (A) P0 (B) P1 (C) P2 (D) P3
11. The FORTRAN statement $X=5/10+3.0 * 15/5.0 * 2+10 * 3$ will compute the value of X as :
- (A) 48.5 (B) 48 (C) 34.5 (D) 35
12. Which conversion specifier is used with hexadecimal data type ?
- (A) %x (B) %d (C) %f (D) %o

13. In a given medium $\frac{\sigma}{\omega\epsilon} = \sqrt{3}$. The magnetic and electric fields are out of phase by :
- (A) 15° (B) 60° (C) 90° (D) 30°
14. A lossless line of length 500 m has $L = 10 \mu\text{H}/\text{m}$ and $C = 0.1 \text{ pF}/\text{m}$ at 1 MHz. The electrical length of the line is :
- (A) 360° (B) 270° (C) 180° (D) 90°
15. If the carrier of a 100 percent modulated AM wave is suppressed, the percentage power saving will be :
- (A) 50 (B) 66.66 (C) 150 (D) 100
16. Ten bit errors occur in two million transmitted bits. The bit error rate is :
- (A) 2×10^{-5} (B) 5×10^{-5} (C) 5×10^{-6} (D) 2×10^{-6}
17. The value of ON - state voltage of an SCR is approximately :
- (A) 100 V (B) 50 V (C) 500 V (D) 2 V
18. A silicon photodetector cannot be used to detect the wavelength :
- (A) $1.3 \mu\text{m}$ (B) $0.633 \mu\text{m}$ (C) $0.85 \mu\text{m}$ (D) $1.0 \mu\text{m}$
19. Which transducer has infinite resolution ?
- (A) thermistor (B) LVDT (C) thermocouple (D) RTD
20. Which controller produces residual error ?
- (A) On-off (B) Integral (C) Proportional (D) PID

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 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) :** Silicon diodes are preferred to germanium diodes for high temperature operation.

Reason (R) : The reverse saturation current in a silicon diode is smaller than in a germanium diode.

22. **Assertion (A) :** In two part networks Y and Z parameters are interrelated and hence need not be defined separately.

Reason (R) : Z parameters cannot be defined at high frequency but Y parameters can be defined.

23. **Assertion (A) :** Multivibrators with 555 are preferred over those with BJT and digital ICs.

Reason (R) : 555 provides variation in duty cycle from 0 to 100% and drive a TTL load.

24. **Assertion (A) :** Race around condition occurs in all flip flops.

Reason (R) : Race around condition occurs in logic circuits due to propagation delay.

25. **Assertion (A) :** Software interrupts are provided in 8086 microprocessors.

Reason (R) : Interrupts are generated by exceptions in 8086 microprocessors.

26. **Assertion (A) :** Break statement is used in switch-case statement.
Reason (R) : In switch-case statement use of break prevents unrelated conditions to be skipped.
27. **Assertion (A) :** An electromagnetic wave propagating in free space along the z - direction is necessarily y - polarized.
Reason (R) : Electromagnetic waves in free space are transverse waves.
28. **Assertion (A) :** BPSK and QPSK modulation schemes increase the binary data rate in a given bandwidth.
Reason (R) : In QPSK modulation each pair of bits is represented by a specific phase.
29. **Assertion (A) :** Modern optical communication systems use the 1.55 μm band.
Reason (R) : Pulse dispersion in optical fibers is minimum at 1.55 μm .
30. **Assertion (A) :** Thermistor linearity can be improved by connecting a resistor in series with the thermistor.
Reason (R) : Connecting a resistance in series with a thermistor will reduce the sensitivity.
31. Consider the diodes given below.
- (i) Germanium diode
 - (ii) Silicon diode
 - (iii) Schottky diode
 - (iv) Point contact diode
- The correct order of increasing cut-in voltage will be :
- (A) (iv) (i) (iii) (ii)
 - (B) (i) (iii) (ii) (iv)
 - (C) (ii) (iv) (iii) (i)
 - (D) (iv) (ii) (i) (iii)

32. Consider the following data size.

- (i) Byte
- (ii) Bit
- (iii) Word
- (iv) Nibble

The correct order of decreasing data size is :

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

33. Consider the following guided transmission lines.

- (i) Coaxial cable
- (ii) Metallic waveguide
- (iii) Optical fiber
- (iv) Twisted pair

The correct order in increasing order of bandwidth is :

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

34. Consider the following electromagnetic waves.

- (i) Microwaves
- (ii) X - rays
- (iii) Ultraviolet radiation
- (iv) Infrared radiation

The correct order in increasing wave length is :

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

35. Consider the following amplifier classes.

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

The correct order in increasing efficiencies is :

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

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

List-I

- (a) MOSFET
- (b) Breakdown Diodes
- (c) IC Fabrication
- (d) Transistor

List-II

- (i) Thermal runaway
- (ii) Isolation
- (iii) Gate Capacitance
- (iv) Avalanche

Codes :

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

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

List-I

- (a) Thevenin's Theorem
- (b) Poles and Zeroes
- (c) Superposition Theorem
- (d) ABCD Parameters

List-II

- (i) Transmission Line
- (ii) Voltage Source
- (iii) S - plane
- (iv) Linear Network

Codes :

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

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

<i>List-I</i>	<i>List-II</i>
(a) Differentiator	(i) $0.5 \text{ V} / \mu\text{s}$
(b) Voltage Regulator	(ii) Wave shaping
(c) V to F convertor	(iii) IC 7809
(d) IC 741	(iv) noise free transmission

Codes :

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

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

<i>List-I</i>	<i>List-II</i>
(a) Counters	(i) Totempole output
(b) TTL logic	(ii) Sequential logic
(c) CMOS	(iii) Fastest logic
(d) ECL	(iv) $V_{DD}/3$

Codes :

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

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

List-I

- (A) IC 8279
(B) IC 8251
(C) IC 8051
(D) IC 8155

List-II

- (i) Serial communication
(ii) Timer counter
(iii) Keyboard controller
(iv) Bit addressable RAM

Codes :

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

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

List-I

- (a) 8 - Characters
(b) do - while
(c) Compiler and linker
(d) Storage class

List-II

- (i) register
(ii) c - variable
(iii) executable program
(iv) executed at least once

Codes :

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

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

List-I

- (a) Klystron
 (b) Gunn Diode
 (c) Magnetron
 (d) PIN Diode

List-II

- (i) Negative Resistance
 (ii) Detection
 (iii) Bunching
 (iv) Microwave Oven

Codes :

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

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

List-I

- (a) Amplitude Modulation
 (b) Frequency Modulation
 (c) Time Division Multiplexing
 (d) Frequency Division Multiplexing

List-II

- (i) Frequency interleaving
 (ii) Multiplexer
 (iii) Modulation index > 1
 (iv) Modulation index < 1

Codes :

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

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

List-I

- (a) Intermodal Dispersion
- (b) Intramodal Dispersion
- (c) Responsivity
- (d) Quantum efficiency

List-II

- (i) Photo diode
- (ii) Laser
- (iii) Multimode Fiber
- (iv) Single mode fiber

Codes :

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

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

List-I

- (a) Digital Multimeter
- (b) Oscilloscope
- (c) Bridge
- (d) LM 35

List-II

- (i) Phase
- (ii) Temperature
- (iii) 4½ digit
- (iv) L or C

Codes :

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

Read the passage below and answer the questions (46-50) that follow based on your understanding of the passage :

The tunnel diode is a thin junction diode which under low forward bias conditions exhibits negative resistance. Because of thin junction and short transit time, it lends to microwave application. Tunnel diode oscillators were found to be unstable. However, if a high Q cavity is loosely coupled to the diode, a highly stable oscillator is obtained with relative independence to temperature and bias voltage. The application of the tunnel diode was in microwave oscillations and negative resistance amplifier.

The diode voltage-current characteristics illustrate two important properties of the tunnel diode, namely, (i) diode exhibits dynamic negative resistance which is useful for oscillator and amplifier, (ii) negative resistance occurs when both the applied voltage and resulting current are low. The tunnel diode is a relatively low power device. The negative resistance is capable of significant power gain.

Tunnel diode amplifiers may be used through out the microwave range as moderate to low noise preamplifiers in all kinds of receivers. Tunnel diode amplifiers are immune to ambient radiation encountered in interplanetary space and hence, practicable for space work.

Gunn discovered the transferred electron effect and this effect was found in Gallium Arsenide and Indium Phosphide. Gunn diodes are used as low power oscillators in microwave receivers. The higher power Gunn oscillators are used as power output oscillators, which include police radars, CW Doppler radars and burglar alarms.

Gunn diodes are greatly superior to IMPATT diodes. Gunn diode amplifiers cannot compete for power output and low noise with GaAs FET amplifiers at frequencies below 30 GHz.

Step recovery diodes are junction diodes which can store energy in their capacitance and then generate harmonics by releasing a pulse of current. These diodes are widely employed in all microwave semiconductor devices. Such a diode is also called a snap - off varactor, which is a silicon or GaAs $p-n$ junction diode. Step recovery diodes are used in amplifiers for low-level noise performance in the X - band

46. Indicate which of the following diodes does not use negative resistance for operation.

- | | |
|--------------------|------------------|
| (A) Schottky diode | (B) Gunn diode |
| (C) IMPATT | (D) Tunnel diode |

47. Which of the following is not used as a microwave detector ?

- | | |
|--------------------|--------------------|
| (A) Crystal diode | (B) Schottky diode |
| (C) Backward diode | (D) PIN diode |

48. One of the following microwave diodes is suitable for low power oscillators only :
- (A) Tunnel (B) Avalanche (C) Gunn (D) IMPATT
49. For best low level noise performance in the X-band one of the following should be used :
- (A) a bipolar transistor (B) a Gunn diode
(C) a step recovery diode (D) an IMPATT diode
50. The transferred-electron bulk effect occurs in :
- (A) Germanium (B) Gallium Arsenide
(C) Silicon (D) Metal Semiconductor Junction

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Space For Rough Work