

Signature and Name of Invigilator

1. (Signature) _____

(Name) _____

2. (Signature) _____

(Name) _____

D-8808

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)

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 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.

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.

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)

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 चिन्हांकित 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 उत्तर-पुस्तिका निरीक्षक महोदय को लौटाना आवश्यक है और परीक्षा समाप्ति के बाद 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. Tunnel diode, with its negative resistance characteristics can be employed for :
(A) Current Amplification (B) Voltage Amplification
(C) Power Amplification (D) All the above
2. When a semiconductor is heavily doped in a range of 10^{17} to 10^{18} impurity atoms/cm³, then it behaves as :
(A) Intrinsic semiconductor (B) Extrinsic semiconductor
(C) Simply as a semiconductor (D) Degenerate semiconductor
3. In a series resonance circuit (RLC) :
(A) Maximum voltage occurs across the C and L below resonance frequency
(B) Maximum voltage occurs across the C and L above the resonance frequency
(C) Maximum voltage occurs across C below resonance frequency and L above resonance frequency
(D) Maximum voltage occurs across C above resonance frequency and L below resonance frequency
4. Which theorem states that in any network if the voltage sources, V_1, V_2, \dots, V_n in series with internal resistances R_1, R_2, \dots, R_n , respectively are in parallel, then the sources can be replaced by a single voltage source in series with single resistance R ?
(A) Millmann's theorem (B) Tellegen's theorem
(C) Compensation theorem (D) Norton's theorem
5. The ripple factor of a half-wave rectifier is found to be :
(A) 1.57 (B) 1.21 (C) 1.12 (D) 1.41

6. The CMRR (Common Mode Rejection Ratio) for a differential amplifier should be :
 (A) zero (B) unity (C) small (D) large
7. The number of flip-flops required to divide a frequency by 32 is :
 (A) 5 (B) 15 (C) 10 (D) 20
8. $\overline{\overline{A} \cdot \overline{B} \cdot \overline{C}}$ is equivalent to :
 (A) $\overline{A} + \overline{B} + \overline{C}$ (B) $\overline{A \cdot B \cdot C}$ (C) $A + B + C$ (D) $A \cdot B \cdot C$
9. The 8086 microprocessor can be made to operate in single stepping mode by setting :
 (A) the direction status flag (B) the overflow status flag
 (C) the parity status flag (D) the trap status flag
10. Which of the following ports of 8255 supports bi-directional data transfer function ?
 (A) Port - A (B) Port - B
 (C) Port - C upper (D) Port - C lower
11. For a statement DO 100 I = L, M, N, the number of iterations will be :
 (A) $\frac{(M-L)}{N}$ (B) $1 + \frac{(M-L)}{N}$
 (C) $1 - \frac{(M-L)}{N}$ (D) $1 + \frac{(M+L)}{N}$
12. What is the error in the given code ?
`int*p;`
`*p = 12.9;`
 (A) pointer p is of type int but is assigned real value
 (B) pointer p is un-initialized, thus can cause error while execution.
 (C) no error in code
 (D) all the above

13. In a copper conductor the electromagnetic wave at 100 MHz penetrates to a depth of $7\mu\text{m}$. The wavelength of the electromagnetic wave is :
- (A) $7\mu\text{m}$ (B) $14\mu\text{m}$ (C) $22\mu\text{m}$ (D) $44\mu\text{m}$
14. The radiation field of an antenna at a distance 'r' varies as :
- (A) $1/r$ (B) $1/r^2$ (C) $1/r^3$ (D) $1/r^4$
15. Given a carrier frequency of 100 kHz and a modulation of 5 kHz, the bandwidth of AM transmission is found to be :
- (A) 5 kHz (B) 105kHz (C) 10kHz (D) 20kHz
16. In high speed TDM, the channels are separated in the receiver by employing :
- (A) OR gate (B) AND gate (C) NOT gate (D) XOR gate
17. The wavelength region $1.55\mu\text{m}$ is important in optical communication because :
- (i) it can be detected by a Si p-i-n diode
(ii) it corresponds to minimum attenuation
(iii) it corresponds to minimum dispersion
(iv) it can be amplified optically
- (A) (i), (ii) are correct (B) (ii) and (iii) are correct
(C) (iii) and (iv) are correct (D) (ii) and (iv) are correct
18. Consider the following statements :
- Thyristors can be turned off by
- (i) reducing the current below the holding current value
(ii) applying a negative voltage to the anode of the device
(iii) reducing the gate current
- Of these statements :
- (A) (i) and (ii) are correct (B) (i) and (iii) are correct
(C) (ii) and (iii) are correct (D) (i), (ii) and (iii) are correct

19. An increase in pH value above 7.0 indicates :
- (A) increasing alkalinity (B) decreasing alkalinity
(C) increasing basicity (D) decreasing basicity
20. A causal discrete time system is stable if the poles of its transfer function lie :
- (A) outside the unit circle (B) on the unit circle
(C) within the unit circle (D) anywhere over the unit circle

Question (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 the correct explanation of (A).
(C) (A) is true but (R) is false
(D) (A) is false but (R) is true
21. **Assertion (A) :** The depletion mode MOSFET is widely used in digital switching circuits.
Reason (R) : For depletion mode the region between the two heavily doped n^+ regions of the MOSFET is made up of lightly doped n material.
22. **Assertion (A) :** A circuit containing reactances is said to be in resonance if the voltage across the circuit is inphase with the current through it.
Reason (R) : At resonance, the power factor of the circuit is zero.
23. **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.

24. **Assertion (A) :** The output of an 8-bit A to D convertor is 80H for an input of 2.5V.
Reason (R) : ADC has an output range of 00 to FFH for an input range of $-5V$ to $+5V$.
25. **Assertion (A) :** A ROM with an access time of the order of hundreds of nanoseconds is suitable for a control memory.
Reason (R) : The time taken to execute an operation in a micro-programmed computer is critically dependant on the access time of the control memory.
26. **Assertion (A) :** In a good conductor skin depth decreases with frequency as $f^{-1/2}$ while in a good dielectric it decreases as f^{-1}
Reason (R) : In a good dielectric the conduction current is very small.
27. **Assertion (A) :** AM has better noise performance than FM.
Reason (R) : AM results in an increase in signal power.
28. **Assertion (A) :** A switched mode power supply is a high efficiency dc-dc converter with an unregulated input dc voltage and a regulated output voltage.
Reason (R) : The efficiency is higher because transistors are used between ON and OFF states.
29. **Assertion (A) :** Optical Fibres offer a very large communication bandwidth.
Reason (R) : Frequency of the optical carrier wave is hundreds of THz.
30. **Assertion (A) :** A Routh-Hurwitz criterion can be applied for stability analysis of feedback control systems with transportation lag.
Reason (R) : The Routh-Hurwitz criterion is an analytical method for stability analysis.

31. The various microprocessor chips which operate at different speeds are :

- (i) P - III
- (ii) P - II
- (iii) 8085
- (iv) 8086

The correct sequence according to their speed of operation in increasing order is :

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

32. Which is the correct sequence in the generation of pulse code modulation ?

- (i) sampling
- (ii) converting to PAM
- (iii) Quantizing
- (iv) Encoding

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

33. Below are listed some electromagnetic waves.

- (i) Microwaves
- (ii) Visible light
- (iii) X-Rays
- (iv) Radiowaves

The correct sequence of their frequencies in increasing order is :

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

34. Listed below are some communication systems.

- (i) Radar
- (ii) Telegraphy
- (iii) Satellite communication
- (iv) Telephony

The correct sequence of their development in time, with earliest first, is :

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

35. Listed below are some semiconducting materials.

- (i) Silicon
- (ii) Germanium
- (iii) Gallium Arsenide
- (iv) Indium Phosphide

The correct sequence in order of increasing band gap is :

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

Question No. 36 to 45 :

In the following question Match **List-I** with **List-II** and select the correct answer using the codes given below the lists :

- 36.**
- | <i>List - I</i> | <i>List - II</i> |
|-----------------------------|------------------------------|
| (a) Voltage controlled | (i) Unijunction transistor |
| (b) Current controlled | (ii) Field Effect transistor |
| (c) Conductivity modulation | (iii) Bipolar transistor |
| (d) Negative resistance | (iv) IMPATT diode |

Code :

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

- 37.**
- | <i>List - I</i> | <i>List - II</i> |
|------------------------|---------------------------|
| (a) Linearity | (i) Superposition Theorem |
| (b) Structure | (ii) Norton's Theorem |
| (c) Equivalent circuit | (iii) Tellegen's Theorem |
| (d) Bilateral | (iv) Reciprocity Theorem |

Code :

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

38.

List - I

- (a) Twisted pair
- (b) Coaxial cable
- (c) Optical Fiber
- (d) Broadcast system

List - II

- (i) High bandwidth line communication
- (ii) Supports transmission radio and TV signals
- (iii) CATV systems
- (iv) Point to point service

Code :

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

39.

List - I

- (a) Multiplexer
- (b) De-multiplexer
- (c) Shift Register
- (d) Encoder

List - II

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

Code :

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

40. *List - I* *List - II*
- | | |
|---------------------------|--------------------|
| (a) Capacitive transducer | (i) Pressure |
| (b) Thermocouple | (ii) Torque |
| (c) Load cell | (iii) Displacement |
| (d) Diaphragm | (iv) Temperature |

Code :

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

41. *List - I* *List - II*
- | | |
|---------------------------|-----------------|
| (a) Rectangular waveguide | (i) TE/TM |
| (b) Dielectric waveguide | (ii) TE M |
| (c) Coaxial line | (iii) Quasi-TEM |
| (d) Microstrip line | (iv) Hybrid |

Code :

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

42. *List - I*

- (a) Pyro electric effect
- (b) Piezo electric effect
- (c) Photovoltaic effect
- (d) Photo emissive effect

List - II

- (i) Emission of electron from a cathode when light is incident on it
- (ii) Change in colour of a hot body with temperature
- (iii) Generation of EMF under stress
- (iv) Conversion of light energy into electrical power

Code :

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

43. *List - I*

- (a) Modem
- (b) Pentium
- (c) C++
- (d) Linux

List - II

- (i) Microprocessor
- (ii) Programming Language
- (iii) Operating system
- (iv) Internet

Code :

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

44.

List - I

- (a) Helical Antenna
- (b) Yagi Antenna
- (c) Log Periodic Antenna
- (d) Horn Antenna

List - II

- (i) Multiband HF
- (ii) Circular polarisation
- (iii) Waveguide
- (iv) High Gain

Code :

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

45.

List - I

- (a) Rayleigh scattering
- (b) Dispersion
- (c) Numerical Aperture
- (d) Splicing

List - II

- (i) Pulse broadening in optical fibers
- (ii) Attenuation in optical fibers
- (iii) Light gathering capacity of fibers
- (iv) Joining of fibers

Code :

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

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

Gunn effect is instrumental in the generation of microwave oscillations in bulk semiconductor materials. The effect was found by Gunn to be exhibited by gallium arsenide and indium phosphide. If a relatively small dc voltage is placed across a thin slice of gallium arsenide, then negative resistance will manifest itself under certain conditions. Basically, there consist merely of ensuring that the voltage gradient across the slice is in excess of about 3300 V/cm. Oscillations will then occur if the slice is connected to a suitably tuned circuit. It is seen that the voltage gradient across the slice of GaAs is very high. Hence, the electron velocity is also high so that oscillations will occur at microwave frequencies.

The Gunn effect is a bulk property of semiconductors and does not depend, as do other semiconductor effects, on either junction or contact properties. The effect is independent of total voltage or current and is not affected by magnetic fields or different type of contacts. Further, it occurs in n-type materials only so that it must be associated with electrons rather than holes. Since the voltage required was proportional to sample length, it was concluded that the electric field, in volts per centimeter, was the factor determining the presence or absence of oscillations. The frequency of oscillations correspond closely to the time that electrons would take to traverse such a slice of n-type material as a result of the voltage applied.

Gallium arsenide is one of a fairly small number of semiconductor materials which, in an n-doped sample, have an empty energy band higher in energy than the highest filled band and the size of the forbidden gap between these two is relatively small. This does not apply to other semiconductor materials such as silicon and germanium. When voltage is applied across the slice, it behaves like a normal positive resistance. However, when the gradient becomes extremely high, the electrons, instead of travelling faster, slow down because they have acquired enough energy to be transferred to the higher band in which the mobility is lower. This gives rise to the name transferred electron effect. Thus the classical case of negative resistance is exhibited as the applied voltage rises past the threshold negative resistance value. The oscillations produced are compatible with the formation and transit time of electron bunches, called domains. These domains are formed due to non-uniform distribution of the doping material throughout the sample of gallium arsenide and the negative resistance phenomenon.

Gunn diodes are employed frequently as low and medium power oscillators in microwave receivers and instruments. The majority of parametric amplifiers use Gunn diodes as pump sources. They have the advantage over IMPATT diodes of having much lower noise. High power Gunn oscillators are used as power output oscillators, generally frequency modulated, in a variety of low-power transmitter applications. These include police radar, CW doppler radar etc.

46. Gunn effect is seen in :

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|----------------------|----------------------------------|
| (A) Silicon | (B) Germanium |
| (C) Indium Phosphide | (D) metal semiconductor junction |

47. For Gunn diodes, gallium arsenide is preferred to silicon because the former :
- (A) has a suitable energy band at a higher level
 - (B) has a higher ion mobility
 - (C) has a suitable band gap
 - (D) is capable of handling higher powers
48. Negative resistance is obtained with a Gunn diode because of :
- (A) electron transfer to a less mobile energy level
 - (B) Avalanche breakdown with the high-voltage gradient
 - (C) electron domain formation at the cathode
 - (D) tunnelling across the contact junction
49. Gunn effect in gallium arsenide slice depends on :
- (A) the total applied voltage
 - (B) the applied magnetic field
 - (C) the total current
 - (D) the applied electric field
50. Which of the following statements are correct ?
- (i) Gunn effect occurs only in n-type materials
 - (ii) Both electrons and holes participate in Gunn effect
 - (iii) Domain formation is essential for oscillations
 - (iv) Gunn effect is seen in all bulk semiconductors
- (A) (i) only (B) (i) and (iv) (C) (i), (ii) and (iii) (D) (i) and (iii)

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Space For Rough Work