PAPER-III
ELECTRONIC SCIENCE

Signature and Name of Invigilator

1. (Signature) __________________________

(Name) ____________________________

2. (Signature) __________________________

(Name) ____________________________

Roll No. | | | | | | | | |

(In figures as per admission card)

Roll No.__________________________________

(In words)

D 8 8 1 0

Time : 2 $^1/_2$ hours] [Maximum Marks : **200**

Number of Pages in this Booklet : **32** Number of Questions in this Booklet : **19**

Instructions for the Candidates

1. Write your roll number in the space provided on the top of this page.
2. Answer to short answer/essay type questions are to be given in the space provided below each question or after the questions in the Test Booklet itself.

   No Additional Sheets are to be used.
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.**
4. Read instructions given inside carefully.
5. One page is attached for Rough Work at the end of the booklet before the Evaluation Sheet.
6. If you write your name or put any mark on any part of the Answer Sheet, except for the space allotted for the relevant entries, which may disclose your identity, you will render yourself liable to disqualification.
7. You have to return the test booklet to the invigilators at the end of the examination compulsorily and must not carry it with you outside the Examination Hall.
8. **Use only Blue/Black Ball point pen.**
9. **Use of any calculator or log table etc., is prohibited.**

परीक्षार्थियों के लिए निर्देश

1. पहले पृष्ठ के ऊपर नियत स्थान पर अपना रोल नम्बर लिखिए ।
2. लघु प्रश्न तथा निबंध प्रकार के प्रश्नों के उत्तर, प्रत्येक प्रश्न के नीचे या प्रश्नों के बाद में दिये हुए रिक्त स्थान पर ही लिखिये ।

   इसके लिए कोई अतिरिक्त कागज का उपयोग नहीं करना है ।
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 ।
4. अन्दर दिये गये निर्देशों को ध्यानपूर्वक पढ़ें ।
5. उत्तर-पुस्तिका के अन्त में कच्चा काम (Rough Work) करने के लिए मूल्यांकन शीट से पहले एक पृष्ठ दिया हुआ है ।
6. 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 ।
7. आपको परीक्षा समाप्त होने पर उत्तर-पुस्तिका निरीक्षक महोदय को लौटाना आवश्यक है और इसे परीक्षा समाप्ति के बाद अपने साथ परीक्षा भवन से बाहर न लेकर जायें ।
8. केवल नीले/काले बाल प्वाईंट पेन का ही इस्तेमाल करें ।
9. किसी भी प्रकार का संगणक (कैलकुलेटर) या लाग टेबल आदि का प्रयोग वर्जित है ।

ELECTRONIC SCIENCE

PAPER-III

Note : This paper is of **two hundred (200)** marks containing **four (4)** sections. Candidates are required to attempt the questions contained in these sections according to the detailed instructions given therein.

SECTION – I

Note : This section consists of **two** essay type questions of **twenty (20)** marks each, to be answered in about **five hundred (500)** words each. **(2 × 20 = 40 marks)**

1. Discuss the structure and working of a Gunn diode and draw its I-V characteristics. Mention the various conditions that must be satisfied by a band structure of semiconductor to exhibit negative resistance.

OR

Explain programming model of 8086.

2. Explain in detail different digital modulation techniques. What is the necessity of modulation ?

OR

What are different types of oscilloscopes ? And explain the working of C.R.O.

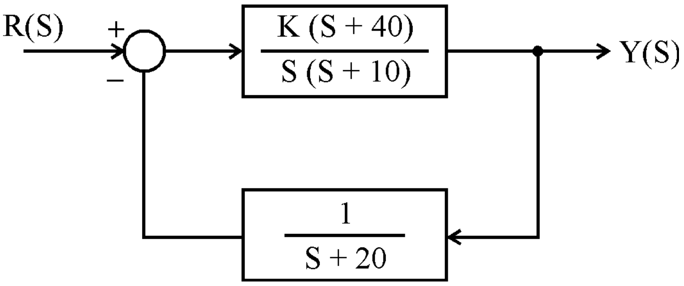
SECTION – II

Note : This section contains **three (3)** questions of **fifteen (15)** marks each to be answered in about **three hundred (300)** words. **(3 × 15 = 45 marks)**

3. For n-channel silicon JFET with $N_D = 10^{16}$ cm^{-3}, $N_A = 10^{19}$ cm^{-3}, a = 1 µm, L = 20 µm, Z = 100 µm and μ_n = 1350 cm^2/vs. Find out the pinch off voltage and pinch off current.

4. Write a program in C or Fortran which calls a function that returns square of a number entered through a keyboard.

5.

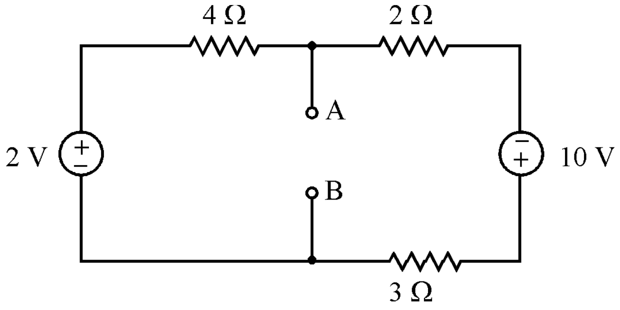


In the above figure, find the gain K that results in marginal stability. Determine the oscillation frequency.

SECTION – III

Note : This section contains **nine (9)** questions of **ten (10)** marks, each to be answered in about **fifty (50)** words. **(9 × 10 = 90 Marks)**

6. Thevenise the circuit across terminals AB of the following circuit.



7. Draw an energy band diagram of an ideal MOS structure at V = 0 for (a) n-type and (b) p-type semiconductor MOS.

8. What is an address operator in C ? Explain its use.

9. What is difference in execution of conditional jump instruction when the jump condition is true and not true ?

10. Explain fan-out for CMOS and TTL logics. What is significance of fan-out ?

11. Explain companding in PCM system.

12. Define Poynting Vector. What is the significance of Poynting theorem ?

13. Draw the characteristics of UJT and indicate V_P and V_V and give their significance.

14. What is the principle used in Blood Pressure measurement ?

SECTION – IV

Note : This section contains **five (5)** questions of **five (5)** marks each based on the following passage. Each question should be answered in about **thirty (30)** words.

(5 × 5 = 25 Marks)

The read type diodes with $n^+ – p – i – p^+$ or $p^+ – n – i – n^+$ structures are also called IMPATT diodes. Its physical mechanism is the interaction of impact ionization avalanche and the transit time of charge carriers and the diode exhibits a differential negative resistance by two effects. The first IMPATT operation reported was obtained from a simple p-n junction. From the small signal theory it has been confirmed that a negative resistance of the IMPATT diode can be obtained from a junction diode with any doping profile. Many IMPATT diodes consist of a high doping avalanching region followed by a drift region where the field is low and the carriers can traverse without avalanching. Some of the structures are : one sided abrupt p-n junction, the linearly graded p-n junction and p-i-n diode. The principle of operation of these diodes are essentially the same.

15. What is impact ionisation avalanche effect ?

16. What is the transit time effect ?

17. Give the structure and doping profile of linearly graded p-n junction.

18. What is the structure and doping profile of a p-i-n diode ?

19. What is the doping profile of p- π -n and p- ν -n diode ?

Space For Rough Work

FOR OFFICE USE ONLY	
Marks Obtained	
Question Number	Marks Obtained
1	
2	
3	
4	
5	
6	
7	
8	
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11	
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19	

Total Marks Obtained (in words) ....

(in figures) ....

Signature & Name of the Coordinator ....

(Evaluation) Date ....