Signature and Name of Invigilator

1. (Signature) _____

   (Name) _____

2. (Signature) _____

   (Name) _____

Roll No. [ ][ ][ ][ ][ ][ ][ ]

(In figures as per admission card)

Roll No._____

(In words)

Test Booklet No.

Time : **2 ¹/₂ hours]**

PAPER-III
ELECTRONIC SCIENCE

[Maximum Marks : **200**

Number of Pages in this Booklet : **32** | Number of Questions in this Booklet : **26**

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 पैन 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 contains **five (5)** questions based on the following paragraph. Each question should be answered in about **thirty (30)** words and carries **five (5)** marks. **(5 × 25 = 25 marks)**

Transducers are energy converters. They are classified as passive and active. The transducers can be electrical or mechanical. However, electrical transducers are preferred since signal conditioning becomes easier. The important parameters for the selection of a transducer are linearity, sensitivity, range repeatability size etc. The transduction involves the principle of resistance, Inductance, Capacitance, photoemission, photo-resistance, thermo-electricity and so on. Some examples of transducers are LVDT, strain gauge, RTD, Bourdon tube, thermistors, photo-diode. The parameters measured with transducers are temperature, pressure, level, flow, force and position etc.

At the input of any Data Acquisition System transducers are necessary.

1.   What is a transducer ?

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2.   What is the advantage of using electrical transducers ?

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3.   Which transducers are used to measure pressure ?

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4. Define the term linearity.

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5. What is the range of K-type and J-type thermocouples ?

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SECTION – II

Note : This section contains **fifteen (15)** questions, each to be answered in about **thirty (30)** words. Each question carries **five (5)** marks.   **(5 × 15 = 75 marks)**

6.   How does the junction capacitance vary with reverse voltage in a p-n junction diode ?

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7. Write the steps involved in fabrication of MOSFET devices.

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8. What is the concept of duality ? Write the duality for at least 5 electrical quantities.

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9. What are h parameters ? State their importance.

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10. What is the difference between x ++ and ++ x ?

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11. What data types the bitwise operators can and cannot operate on ?

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12. What is Poynting Vector ? What is its physical importance ?

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13. Write Maxwell's equation in integral and differential forms.

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14. What is the principle of super heterodyne receivers ? Why it is preferred ?

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15. Compare ASK, FSK and PSK.

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16. State applications of Choppers.

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17. Explain the meaning of $3\frac{1}{2}$ digit in multimeters.

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18. What are different methods of Blood Pressure measurements ?

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19. Explain the importance of derivative term in PID Controllers.

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20. State the Nyquist Criterion.

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SECTION – III

Note : This section contains **five (5)** questions of **twelve (12)** marks each. Each question is to be answered in about **two hundred (200)** words.

$$(12 \times 5 = 60 \text{ marks})$$

21. Compare JFET with MOSFET. Draw I-V characteristics of depletion layer MOSFET and explain the different parameters of MOSFET. What is the basic difference between Depletion and Enhancement type MOSFETs ?

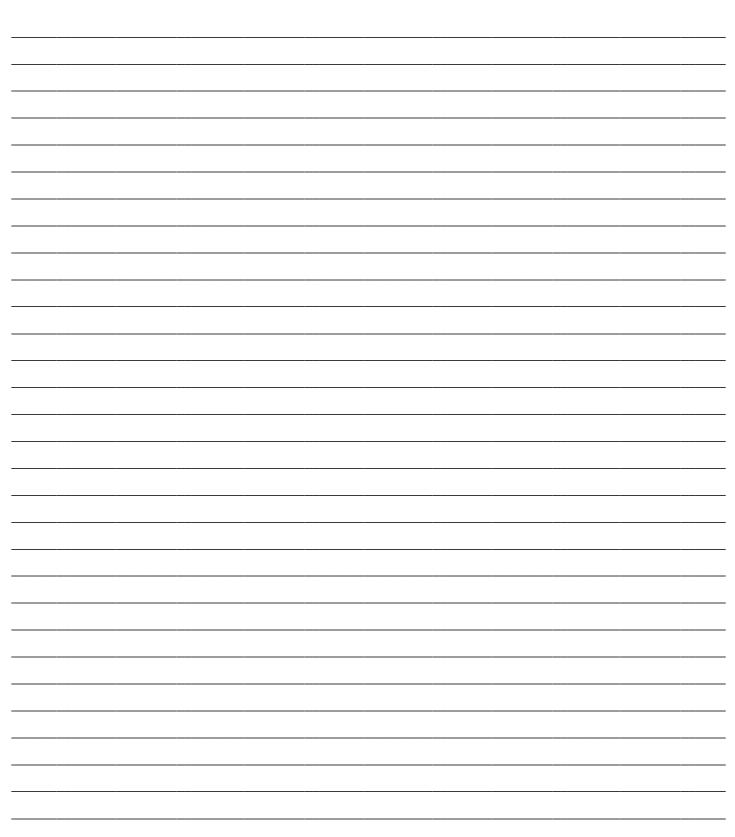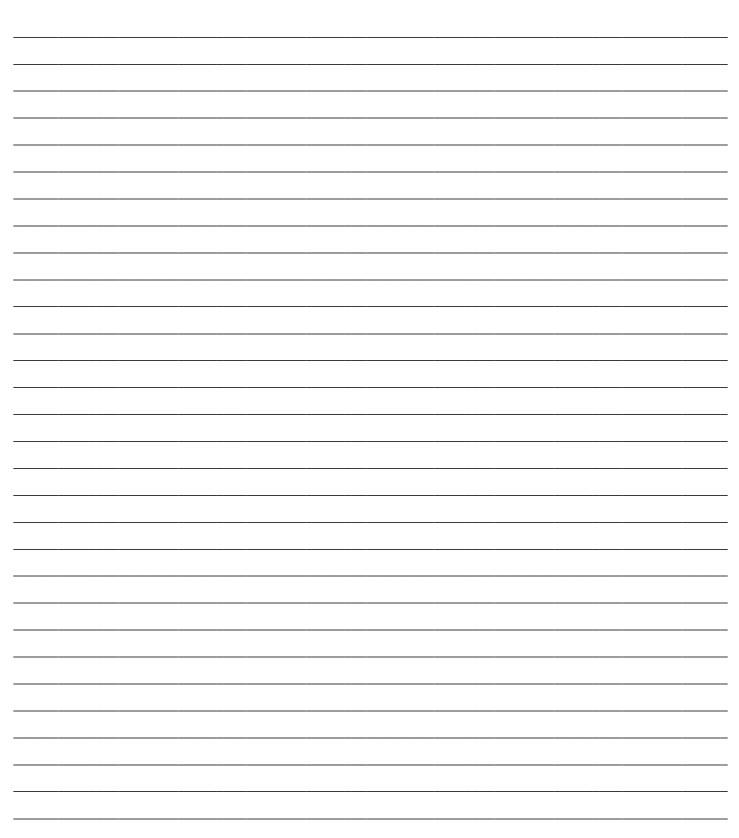22. What is Modulus of a Counter ? Give design Mod-5 synchronous counter. Draw the required timing diagrams.

23. (a) Write a program in 'C'/C ++/FORTRAN, which implements On-off control or proportional control.
    (b) Write a program to swap the values stored in two variables.

24. (a) How bunching is formed in Klystron ? Explain.
    (b) What are the applications of Smith chart ?

25. (a) Draw the functional block diagram of CRO and explain the function of sweep generator. What is importance of compensated probes ?
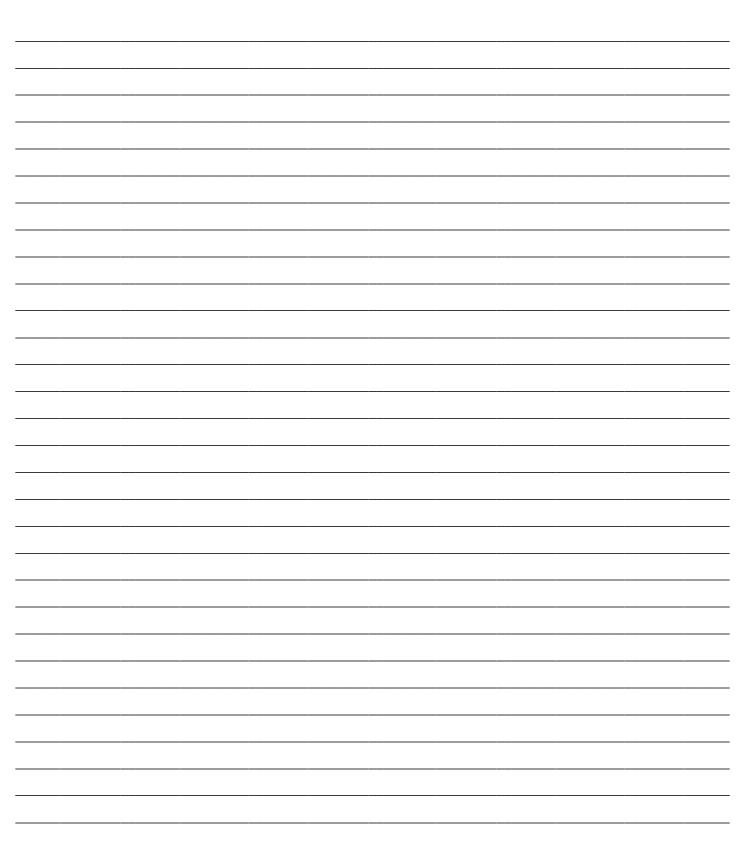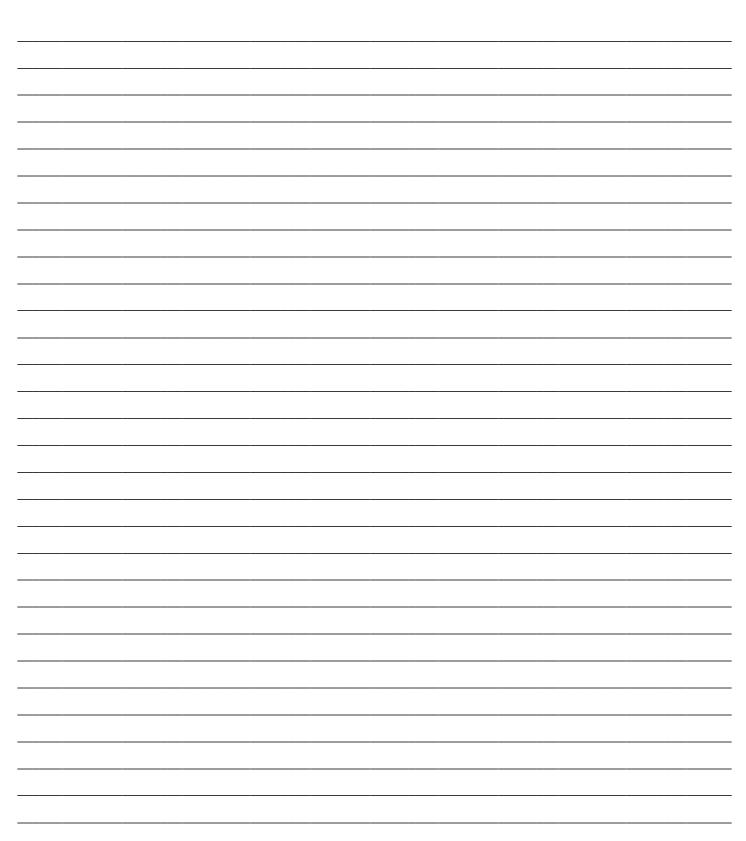   (b) How phase measurements can be carried out with CRO ?

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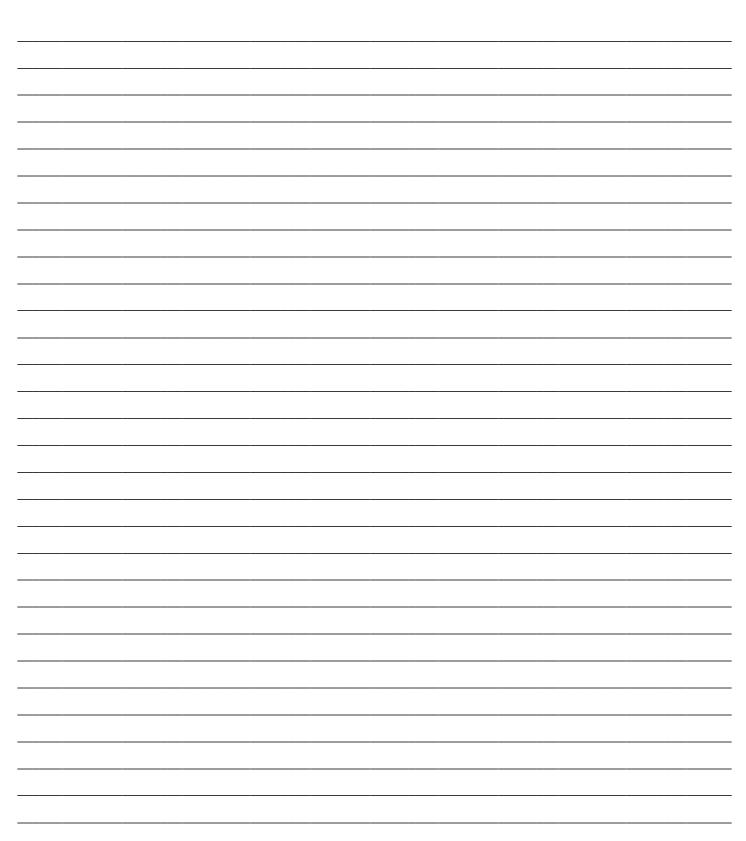_____
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SECTION – IV

Note : This section consists of one essay type question of **forty (40)** marks to be answered in about **one thousand (1000)** words on any **one** of the following topics.　　　　　　　　　　　　　　　　**(1 × 40 = 40 marks)**
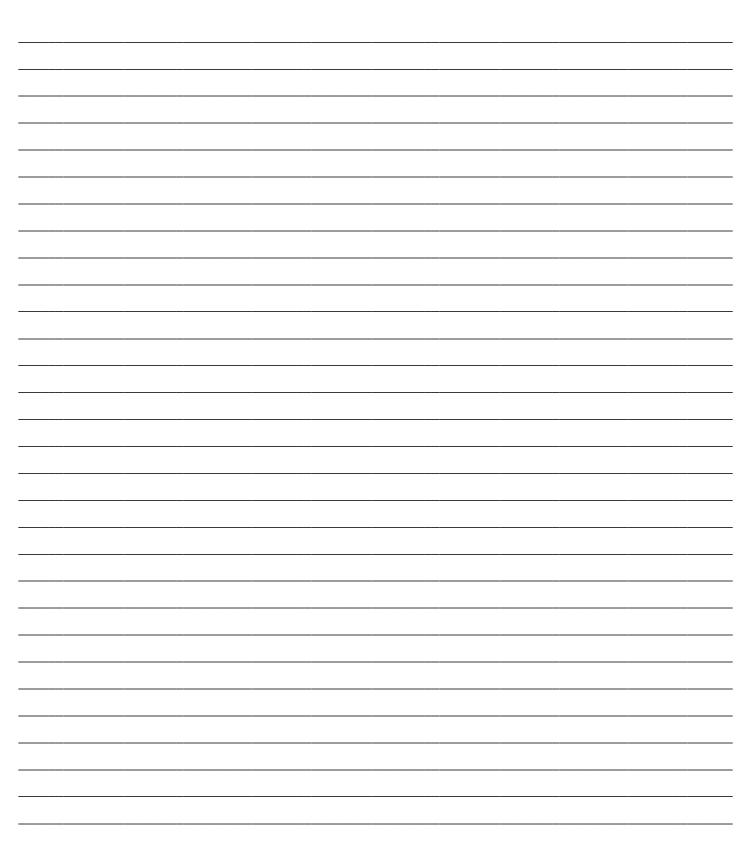
26. (a) Explain the difference between Zener and Avalanche breakdown mechanisms. Draw I-V characteristics of a Zener diode and explain its parameters.
   (b) What is Hall effect ? And derive the expression for Hall Voltage.
   (c) What is a semiconductor diode laser ? Describe its structure and explain its working.
   (d) Explain the working principle of Electron microscope along with its diagram.

OR

   (a) What is interfacing ? How is the incompatibility due to the following are removed by interfacing
      (i) voltage other than TTL ?
      (ii) currents in excess of driving capacity of the bus ?
      (iii) capacitive load greater than 100 pF ?
   (b) Draw the circuit of a Schmitt Trigger and explain its working with suitable waveforms.
   (c) What are various digital modulation techniques ? Explain any one.
   (d) Draw the structure of a stepper motor and explain its working principle along with its industrial applications.

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