

PAPER-II
ELECTRONIC SCIENCE

Signature and Name of Invigilator

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

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

Roll No.

--	--	--	--	--	--	--	--

(In figures as per admission card)

Roll No. _____
(In words)

J 8 8 1 6

Time : 1 ¼ hours]

[Maximum Marks : 100

Number of Pages in this Booklet : 16

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 Test Booklet Number should be entered on the OMR Sheet and the OMR Sheet Number should be entered on this Test Booklet.
4. Each item has four alternative responses marked (1), (2), (3) and (4). You have to darken the circle as indicated below on the correct response against each item.
Example : ① ② ● ④
where (3) is the correct response.
5. Your responses to the items are to be indicated in the **OMR Sheet given inside the Booklet only**. If you mark your response at any place other than in the circle in the OMR 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, Roll Number, Phone Number or put any mark on any part of the OMR Sheet, except for the space allotted for the relevant entries, which may disclose your identity, or use abusive language or employ any other unfair means, such as change of response by scratching or using white fluid, you will render yourself liable to disqualification.
9. You have to return the Original OMR Sheet to the invigilators at the end of the examination compulsorily and must not carry it with you outside the Examination Hall. You are, however, allowed to carry original question booklet and duplicate copy of OMR Sheet on conclusion of examination.
10. Use only Black Ball point pen provided by C.B.S.E.
11. Use of any calculator or log table etc., is prohibited.
12. There is no negative marks for incorrect answers.

परीक्षार्थियों के लिए निर्देश

1. इस 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 पुस्तिका 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 का नंबर OMR पत्रक पर अंकित करें और OMR पत्रक का नंबर इस प्रश्न-पुस्तिका पर अंकित कर दें ।
4. प्रत्येक प्रश्न के लिए चार उत्तर विकल्प (1), (2), (3) तथा (4) दिये गये हैं । आपको सही उत्तर के वृत्त को पेन से भरकर काला करना है जैसा कि नीचे दिखाया गया है :
उदाहरण : ① ② ● ④
जबकि (3) सही उत्तर है ।
5. प्रश्नों के उत्तर केवल प्रश्न पुस्तिका के अन्दर दिये गये OMR पत्रक पर ही अंकित करने हैं । यदि आप OMR पत्रक पर दिये गये वृत्त के अलावा किसी अन्य स्थान पर उत्तर चिह्नानंकित 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 OMR पत्रक पर नियत स्थान के अलावा अपना नाम, रोल नम्बर, फोन नम्बर या कोई भी ऐसा चिह्न जिससे आपकी पहचान हो सके, अंकित करते हैं अथवा अभद्र भाषा का प्रयोग करते हैं, या कोई अन्य अनुचित साधन का प्रयोग करते हैं, जैसे कि अंकित किये गये उत्तर को मिटाना या सफेद स्याही से बदलना तो परीक्षा के लिये अयोग्य घोषित किये जा सकते हैं ।
9. आपको परीक्षा समाप्त होने पर मूल OMR पत्रक निरीक्षक महोदय को लौटाना आवश्यक है और परीक्षा समाप्ति के बाद उसे अपने साथ परीक्षा भवन से बाहर न लेकर जायें । हालाँकि आप परीक्षा समाप्ति पर मूल प्रश्न-पुस्तिका तथा OMR पत्रक की डुप्लीकेट प्रति अपने साथ ले जा सकते हैं ।
10. केवल C.B.S.E. द्वारा प्रदान किये गये 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 उत्तरों के लिए कोई नकारात्मक अंक नहीं है ।

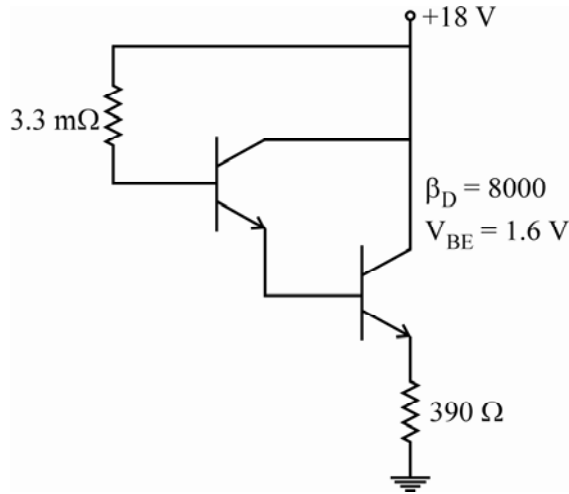


ELECTRONIC SCIENCE

Paper – II

Note : This paper contains **fifty (50)** objective type questions of **two (2)** marks each. **All** questions are compulsory.

1. In a circuit shown below the base current is

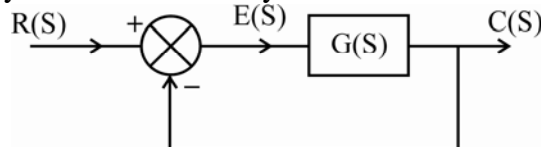


- | | |
|------------------|-----------------|
| (1) 2.55 μ A | (2) 5.4 μ A |
| (3) 2.66 μ A | (4) 3.6 μ A |

2. The threshold voltage of CMOS inverter ($V_{th} = V_{in} = V_{out}$) can be expressed as

- | | |
|--|--|
| (1) $\frac{V_{ton} + \sqrt{\frac{1}{k_R}} (V_{DD} + V_{top})}{1 + \sqrt{\frac{1}{k_R}}}$ | (2) $\frac{V_{ton} - \sqrt{\frac{1}{k_R}} (V_{DD} + V_{ton})}{1 - \sqrt{\frac{1}{k_R}}}$ |
| (3) $\frac{V_{top} + \sqrt{\frac{1}{k_R}} (V_{DD} + V_{ton})}{1 - \sqrt{\frac{1}{k_R}}}$ | (4) $\frac{V_{top} - \sqrt{\frac{1}{k_R}} (V_{DD} + V_{top})}{1 + \sqrt{\frac{1}{k_R}} (V_{ton})}$ |

3. Consider a unity feedback control system as shown in the following figure :



The steady state error is given as

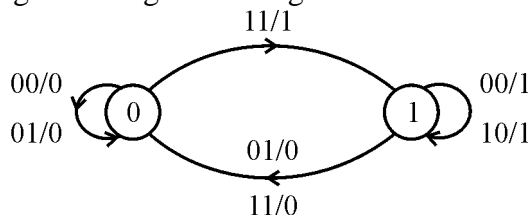
- | | |
|---|---|
| (1) $\lim_{s \rightarrow 0} \frac{R(S)}{1 + SG(S)}$ | (2) $\lim_{s \rightarrow 0} \frac{SR(S)}{1 + G(S)}$ |
| (3) $\lim_{s \rightarrow 0} \frac{SR(S)}{1 - G(S)}$ | (4) $\lim_{s \rightarrow 0} \frac{R(S)}{1 - SG(S)}$ |

4. A conducting line on an IC chip is 2.8 mm long and has a rectangular cross-section 1×4 micrometer. A current of 5 mA produces a voltage drop of 100 mV across the line. If the electron mobility is $500 \text{ cm}^2/\text{V.s.}$, the electron concentration is
- (1) $4.38 \times 10^{21} \text{ cm}^{-3}$ (2) $4.38 \times 10^{27} \text{ cm}^{-3}$
 (3) $3.98 \times 10^{21} \text{ cm}^{-3}$ (4) $4.29 \times 10^{27} \text{ cm}^{-3}$

5. In emitter bias configuration, the stability factor $S(I_{CO})$ is defined as

(1) $(\beta + 1) \frac{1 + \frac{R_B}{R_E}}{\frac{R_B}{R_E} + (\beta + 1)}$ (2) $\frac{1 + \frac{R_B}{R_E}}{\frac{R_B}{R_E} + (\beta + 1)}$
 (3) $\frac{(\beta + 1)}{(\beta + 1) + \frac{R_B}{R_E}}$ (4) $(\beta + 1) \frac{1 + \frac{R_B}{R_E}}{(\beta + 1) + \frac{R_E}{R_B}}$

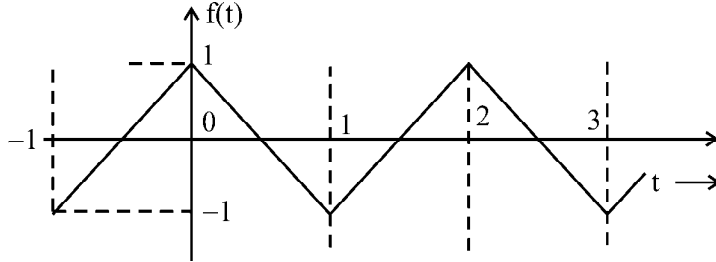
6. The following state diagram belongs to



- (1) J K flip flop (2) R S flip flop
 (3) T flip flop (4) D flip flop
7. 8086 is interfaced to two 8259s (programmable interval timer). If 8259s are in master slave configuration, the number of interrupts available to the 8086 microprocessor is
- (1) 8 (2) 16
 (3) 32 (4) 64
8. A function q that accepts a pointer to a character as argument and returns a pointer to an array of integer, can be declared as
- (1) `int * q (char *) []` (2) `int (* q (char *)) []`
 (3) `int (* q) (char *) []` (4) None of the above
9. TRAPATT is used as
- (1) amplifier in radars
 (2) local oscillator in radars
 (3) switch in communication systems
 (4) low frequency oscillator

10. Tunnel diode is used as
- | | |
|------------------------|------------------------------|
| (1) High speed switch | (2) Clipper |
| (3) Low gain amplifier | (4) Low frequency oscillator |

11. The fourier series of the following figure is



- | |
|---|
| (1) $\frac{8}{\pi^2} \left[\sin(\pi t) + \frac{1}{9} \sin(3\pi t) + \frac{1}{25} \sin(5\pi t) + \dots \right]$ |
| (2) $\frac{8}{\pi^2} \left[\sin(\pi t) - \frac{1}{9} \cos(3\pi t) + \frac{1}{25} \sin(5\pi t) + \dots \right]$ |
| (3) $\frac{8}{\pi^2} \left[\cos(\pi t) + \frac{1}{9} \cos(3\pi t) + \frac{1}{25} \cos(5\pi t) + \dots \right]$ |
| (4) $\frac{8}{\pi^2} \left[\cos(\pi t) - \frac{1}{9} \sin(3\pi t) + \frac{1}{25} \cos(5\pi t) + \dots \right]$ |

12. Which of the following cannot be the Fourier series expansion of a periodic signal ?

- | | |
|-----------------------------------|--|
| (1) $x(t) = 2 \cos t + 3 \cos 3t$ | (2) $x(t) = 2 \cos \pi t + 7 \cos t$ |
| (3) $x(t) = \cos t + 0.5$ | (4) $x(t) = 2 \cos 1.5 \pi t + \sin 3.5 \pi t$ |

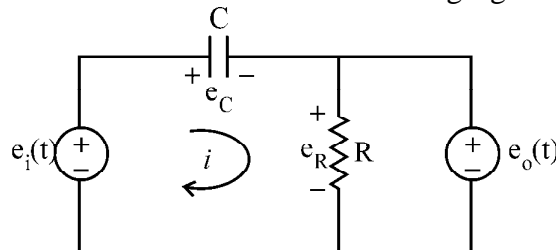
13. The main advantage of TDM over FDM is that it

- | | |
|----------------------------|---------------------------------------|
| (1) needs less power | (2) needs less bandwidth |
| (3) needs simple circuitry | (4) gives better signal / noise ratio |

TDM stands for Time Division Multiplexing

FDM stands for Frequency Division Multiplexing

14. Consider the RC circuit shown in the following figure



The differential equation of the system will be

- | | |
|--|---|
| (1) $\frac{de_i(t)}{dt} = \frac{e_o(t)}{RC} + \frac{de_o(t)}{dt}$ | (2) $\frac{de_i(t)}{dt} = \frac{1}{RC} \frac{de_o(t)}{dt} + e_o(t)$ |
| (3) $\frac{1}{RC} \frac{de_i(t)}{dt} = \frac{1}{RC} \frac{de_o(t)}{dt} - e_o(t)$ | (4) $\frac{de_i(t)}{dt} = \frac{e_o(t)}{RC} - \frac{de_o(t)}{dt}$ |

15. The state-space model of a system is given as

$$\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \end{bmatrix} = \begin{bmatrix} 1 & 0 \\ 1 & 1 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} + \begin{bmatrix} 1 \\ 1 \end{bmatrix} u(t)$$

where $u(t)$ is a unit step input occurring at $t = 0$ and $x(0) = \begin{bmatrix} 1 \\ 0 \end{bmatrix}$.

The time response of the system is

- | | |
|--|---|
| (1) $\begin{bmatrix} 2e^t + 1 \\ 2t e^{-t} \end{bmatrix}$ | (2) $\begin{bmatrix} 2e^t - 1 \\ 2t e^t \end{bmatrix}$ |
| (3) $\begin{bmatrix} 2e^{-t} + 1 \\ 2t e^{-t} \end{bmatrix}$ | (4) $\begin{bmatrix} e^{-t} + 1 \\ 2 e^t \end{bmatrix}$ |

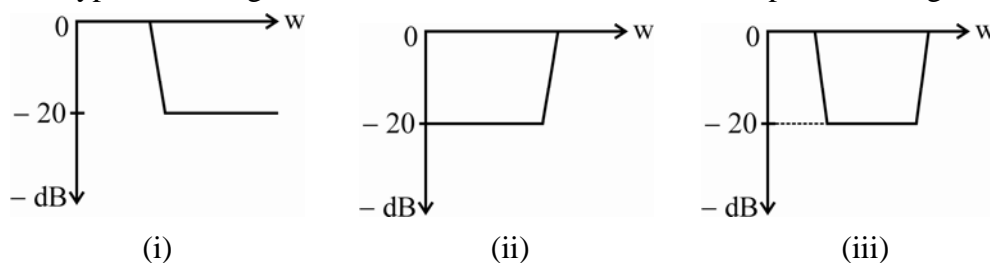
16. If 'L' is the length, 'W' is the width and 't' is the thickness of a semiconductor layer to form a resistor, the sheet resistance is defined as

- | | |
|----------------------|-------------------------|
| (a) $\frac{\rho}{t}$ | (b) $\frac{\rho L}{tA}$ |
| (c) $\frac{R}{t}$ | (d) $\frac{RW}{L}$ |

Out of the above which one is correct ?

- | | |
|------------------------------|------------------------------|
| (1) (a) and (b) are correct. | (2) (b) and (d) are correct. |
| (3) (a) and (d) are correct. | (4) (b) and (c) are correct. |

17. The typical dB magnitude versus characteristics of the compensators is given below :



- | |
|---|
| (a) (i) is log compensator and (ii) is lead compensator |
| (b) (ii) is lead compensator and (i) is log compensator |
| (c) (ii) is lead compensator and (iii) is log compensator |
| (d) (i) is log compensator and (ii) is log-lead compensator |

Which of the above are correct ?

- | | |
|-----------------|-----------------|
| (1) (a) and (b) | (2) (b) and (c) |
| (3) (a) and (d) | (4) (b) and (d) |

18. In reverse bias abrupt p-n junction the depletion region thickness is

- (a) $\sqrt{\frac{2\epsilon_{si}}{q} \left(\frac{N_A + N_D}{N_A N_D} \right)} (\phi_o - V)$ (b) $\sqrt{\frac{2\epsilon_{si}}{q} \left(\frac{N_A N_D}{N_A + N_D} \right)} (\phi_o - V)$
 (c) $\sqrt{\frac{2\epsilon_{si}}{q} \left(\frac{N_A - N_D}{N_A + N_D} \right)} (V - \phi_o)$ (d) $\sqrt{\frac{2\epsilon_{si}}{q} \left(\frac{N_A N_D}{N_A - N_D} \right)} V$

Out of these which is correct answer

- (1) (a) is correct and (b) is wrong (2) (b) is correct and (c) is wrong
 (3) (a) and (b) are correct (4) (d) is correct and (a) is wrong

19. For the counter to count upwards starting from 0000 to 1111, following statement are given :

- (a) LOAD input is high (b) $\overline{\text{LOAD}}$ input is high
 (c) CLEAR is high (d) Enable input is low

Out of the above, the following is the correct answer :

- (1) (a), (b) and (d) (2) (b), (c) and (d)
 (3) (a), (c) and (d) (4) (b) and (c)

20. Assume that the 8255 gets selected whenever A15 – A11 are high during I/O read or write cycles. The A2 and A1 are connected to A1 and A0 of 8255 chip, then the address for port C of 8255 is

- (a) FEh (b) 03h
 (c) FF03h (d) FFh

Codes :

- (1) (a) and (b) are correct (2) (c) and (d) are correct
 (3) (a) and (d) are correct (4) (b) and (d) are correct

21. A function xyz is defined as :

```
Void xyz (int a = 0, int b, int c = 0)
{
    cout << a << b << c;
}
```

Which of the following calls are illegal ?

(Assume h, g are declared as integers)

- (a) xyz(); (b) xyz (h, h) ;
 (c) xyz (h); (d) xyz (g, g);

Codes :

- (1) (a) and (c) are correct (2) (b) and (d) are correct
 (3) (a) and (b) are correct (4) (b) and (c) are correct

22. For transmission lines, following statements are given :

- (a) For open circuited transmission line VSWR is ∞ .
- (b) For short circuited transmission line VSWR is 0.
- (c) For short circuited transmission line VSWR is ∞ .
- (d) The cut off frequency for TEM wave is 0 Hz.

Out of the above statements, following is correct :

- (1) (a), (b)
- (2) (a), (c)
- (3) (a), (b) and (d)
- (4) (a), (c) and (d)

23. Which of the following statements are correct ?

- (a) PAM can be detected by a bandpass filter.
- (b) Flat-top sampling leads to an aperture effect.
- (c) Noise can be reduced by increasing sampling rate.
- (d) Pulse code modulation is form of digital modulation.

Codes :

- (1) (a), (b) and (d) are correct
- (2) (a), (b) and (c) are correct
- (3) (a) and (b) are correct
- (4) (b) and (d) are correct

24. A SCR may be turned OFF by

- (a) Interrupting its anode current.
- (b) Reversing polarity of its anode cathode voltage.
- (c) Low current drop out
- (d) When the gate return to 0 V after the trigger pulse is removed.

Codes :

- (1) (a), (b) and (c) are correct
- (2) (a), (b) and (d) are correct
- (3) (b), (c) and (d) are correct
- (4) (a) and (b) are correct

25. Consider the following statements regarding Fourier transform :

- (a) The Fourier transform of an impulse function is a constant function.
- (b) The Fourier transform of an impulse function is a sine function
- (c) The Fourier transform of a constant function is an impulse function.
- (d) The Fourier transform of a constant function is a signum function.

Which of the above statements are correct ?

- (1) (a) and (b)
- (2) (b) and (c)
- (3) (b) and (d)
- (4) (a) and (c)

26. Match the following lists :

List – I

- a. MOSFET
- b. JFET
- c. PN Junction diode
- d. BJT

List – II

- i. $I_{dss} \left(1 - \frac{V_{gs}}{V_p}\right)^2$
- ii. $K \frac{W}{L} (V_{gs} - V_{th}) V_{ds}$
- iii. $I_o \left(e^{\frac{qV}{kT}} - 1\right)$
- iv. $\beta = \frac{I_C}{I_B}$

Codes :

- | | a | b | c | d |
|-----|-----|-----|-----|-----|
| (1) | ii | i | iii | iv |
| (2) | i | iii | ii | iv |
| (3) | iii | ii | iv | i |
| (4) | i | ii | iv | iii |

27. Match the following lists :

List – I

- a. Electro-encephalogram
- b. Electro-myogram
- c. Electrogoniogram
- d. Electro-oculogram

List – II

- i. Electrical activity of brain
- ii. Eye movements
- iii. Electrical activity of skeletal muscles
- iv. Muscle activity in the gastro intestinal

Codes :

- | | a | b | c | d |
|-----|-----|-----|----|-----|
| (1) | ii | iii | iv | i |
| (2) | iii | iv | i | ii |
| (3) | iv | i | ii | iii |
| (4) | i | iii | iv | ii |

28. Match the following lists :

List – I

- a. Si-band gap
- b. Ge-band gap
- c. Ga As band gap
- d. Si C band gap

List – II

- i. 3.3 eV
- ii. 1.12 eV
- iii. 0.7 eV
- iv. 1.43 eV

Codes :

- | | a | b | c | d |
|-----|----|-----|-----|-----|
| (1) | ii | iii | iv | i |
| (2) | i | ii | iv | iii |
| (3) | ii | i | iii | iv |
| (4) | iv | ii | iii | i |

29. Match the following lists :

- | List – I | | List – II | |
|-----------------|--------------------------------|------------------|--|
| a. IC 74198 | i. Quad D flip flop | | |
| b. IC 74175 | ii. J K master slave flip flop | | |
| c. IC 74104 | iii. 8 bit shift register | | |
| d. IC 74132 | iv. Quad Schmitt trigger | | |

Codes :

- | | a | b | c | d |
|-----|-----|----|-----|-----|
| (1) | i | ii | iii | iv |
| (2) | ii | i | iii | iv |
| (3) | iv | ii | i | iii |
| (4) | iii | i | ii | iv |

30. Match the following in context of 8086 :

- | List – I | | List – II | |
|--------------------------|-------------------------------------|------------------|--|
| a. MOV AL, [5923 h] | i. Register relative addressing | | |
| b. MOV AL, [BX] | ii. Memory operand addressing mode | | |
| c. MOV DL, 0Ah [BX] | iii. Relative base index addressing | | |
| d. MOV AL, F5h [BP] [SI] | iv. Register indirect addressing | | |

Codes :

- | | a | b | c | d |
|-----|-----|----|----|-----|
| (1) | ii | i | iv | iii |
| (2) | i | ii | iv | iii |
| (3) | iii | i | ii | iv |
| (4) | ii | iv | i | iii |

31. Match the following lists :

- | List – I | | List – II | |
|-----------------|------------------|------------------|--|
| a. Array | i. Heterogeneous | | |
| b. Union | ii. Homogeneous | | |
| c. Volatile | iii. Structure | | |
| d. Bit-field | iv. Qualifier | | |

Codes :

- | | a | b | c | d |
|-----|----|-----|-----|-----|
| (1) | ii | iii | i | iv |
| (2) | ii | i | iv | iii |
| (3) | i | iii | ii | iv |
| (4) | i | ii | iii | iv |

32. Match the following lists :

List – I

- a. VSWR
- b. Reflection coefficient
- c. Propagation coefficient
- d. Characteristic impedance

List – II

- i. ≤ 1
- ii. $\sqrt{\frac{(R + j \omega L)}{(G + j \omega C)}}$
- iii. $\sqrt{(R + j \omega L) (G + j \omega C)}$
- iv. ≥ 1

Codes :

- | | | | | |
|-----|-----|-----|-----|-----|
| | a | b | c | d |
| (1) | i | iv | ii | iii |
| (2) | iv | i | iii | ii |
| (3) | iii | i | ii | iv |
| (4) | i | iii | iv | ii |

33. Match the following lists :

List – I

(Frequency Range)

- a. 300 kHz – 3 MHz
- b. 430 THz – 750 THz
- c. 30 GHz – 300 GHz
- d. 30 MHz – 300 MHz

List – II

(Typical Application)

- i. FM Broadcasting, TV
- ii. Satellite communication
- iii. AM Broadcasting
- iv. Optical communication

Codes :

- | | | | | |
|-----|-----|-----|----|----|
| | a | b | c | d |
| (1) | iii | iv | i | ii |
| (2) | iii | iv | ii | i |
| (3) | iv | iii | i | ii |
| (4) | iv | iii | ii | i |

34. Match the following lists :

List – I

- a. Photodiode
- b. LASER
- c. Solar cell
- d. Opto-coupler

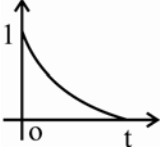
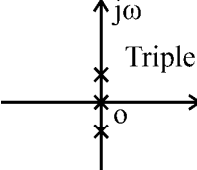
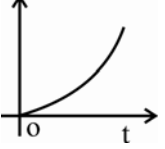
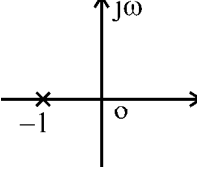
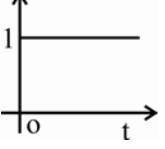
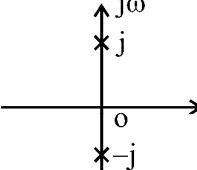
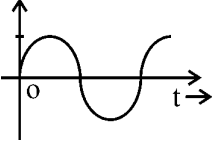
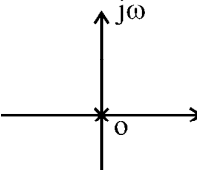
List – II

- i. Prevent high voltages from affecting the system receiving the signal.
- ii. Power consumption is negative
- iii. Exhibits increase in reverse current with light intensity
- iv. Degenerate semi-conductors

Codes :

- | | | | | |
|-----|-----|-----|-----|-----|
| | a | b | c | d |
| (1) | iv | iii | i | ii |
| (2) | i | iv | ii | iii |
| (3) | i | iv | iii | ii |
| (4) | iii | iv | ii | i |

35. Match the following lists :

List – I		List – II	
a.		i.	
b.		ii.	
c.		iii.	
d.		iv.	

Codes :

- | | a | b | c | d |
|-----|----|-----|-----|-----|
| (1) | ii | i | iv | iii |
| (2) | i | iv | iii | ii |
| (3) | ii | i | iii | iv |
| (4) | i | iii | iv | ii |

Directions : Question No. 36 to 45 :

The following items consist of two statements, one labelled as “**Assertion (A)**” and the other labelled as the “**Reason (R)**”. You are to examine the 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 answer to these items using the codes given below and mark your answer accordingly.

Codes :

- (1) Both (A) and (R) are true and (R) is the correct explanation of (A).
- (2) Both (A) and (R) are true, but (R) is not the correct explanation of (A).
- (3) (A) is true, but (R) is false.
- (4) (A) is false, but (R) is true.

36. Assertion (A) : MOSFET can be used to drive high current and high voltage networks without drawing current or power from the driving circuits.

Reason (R) : The high input impedances of FET essentially isolates the two parts of the network without the need of optical or electromagnetic linkages.

37. Assertion (A) : Duality is a property of circuit equations.

Reason (R) : Two circuits are said to be dual when the mesh equations that describe the behaviour of one circuit are found to be identical in the form of nodal equations that describe the other.

38. Assertion (A) : Clippers are networks that employ diodes to clip away a portion of an input signal without distorting the remaining part of the applied waveforms.

Reason (R) : In clipper circuit, the orientation of diode is very important and it decide the portion of the wave to be clipped. Clippers may be series or parallel type, depending upon the series/parallel connection of diode with the load.

39. Assertion (A) : In a conservative field the work done in moving from one point to another is independent of the path.

Reason (R) : In a conservative field, there is a mechanism for dissipating energy corresponding to positive work done and a source from which energy could be absorbed, if the work were negative.

40. Assertion (A) : For DAA instruction in 8086 μ P, if four LSBs of register AL are greater than 9 or $AC = 1$ then 6 is added to the four LSBs of register AL.

Reason (R) : Because AL contains binary sum which needs to be converted into BCD sum.

41. Assertion (A) : In 'C' language, if 'a' is name of an array and '++' operator is used to increment the value of 'a' then compiler will flag an error.

Reason (R) : 'a' is 'const' type pointer.

42. Assertion (A) : Noise margin may be defined as the allowable level of additive noise for proper implementation of logic value at 0 and 1 without any possibility of misinterpretation.

Reason (R) : Noise Margin (NM), It may be defined as for high level :

$$NM_H = V_{1H, \min} - V_{0H, \min}$$

Further for low level, it is defined as :

$$NM_L = V_{0L, \max} - V_{1L, \max}$$

43. Assertion (A) : Baseband designates the band of frequencies representing the signal supplied by the source of information.

Reason (R) : The frequency of baseband signal is equal to the carrier wave signal frequency.

44. Assertion (A) : In Lasers, the photons emitted has the same energy as the incident photon and are in phase with it.

Reason (R) : The amplitudes of individual photons add to produce a brighter light.

45. Assertion (A) : If the characteristic equation contains any root on the imaginary axis, then the output response will have sustained oscillations.

Reason (R) : The poles or the roots of the characteristic equation should not lie in the right half of s-plane for system stability.

Read the passage and answer the following questions numbering from **46 – 50** :

The physics of semiconductor devices is dependent on the physics of semiconductors itself. The most important semiconductors are Germanium, Silicon and Gallium Arsenide. The GaAs has different properties than Silicon or Germanium. Pure silicon is intrinsic and contains negligibly small amount of impurities. Each silicon atom shares its four valance electrons with the four neighbouring atoms forming covalent bonds. An extrinsic silicon is achieved by introducing the impurities. The band structure of a solid can be obtained by solving a Schrodinger equation of an approximate one electron problem.

46. The law of mass action in semiconductor is

(1) $n + p = n_i^2$

(2) $n \cdot p = n_i^2$

(3) $n \cdot p = n_i$

(4) $n^2 p = n_i^2$

47. The Fermi-Dirac distribution function is

(1) $\frac{1}{1 - \exp\left(\frac{E - E_F}{kT}\right)}$

(2) $\frac{1}{1 + \exp\left(\frac{E - E_F}{kT}\right)}$

(3) $\frac{\Delta E}{1 + \exp\left(\frac{E - E_F}{kT}\right)}$

(4) $\frac{\Delta E}{1 - \exp\left(\frac{E - E_F}{kT}\right)}$

48. The Fermi level for the extrinsic semiconductor (n-type) lies

- (1) close to the middle of the bandgap
- (2) below the conduction band
- (3) above the conduction band
- (4) above the valance band

49. The number of ionised donors are given by

$$(1) \quad N_D^+ = N_D \left[1 - \frac{1}{1 + \frac{1}{g} \exp\left(\frac{E_D - E_F}{kT}\right)} \right]$$

$$(2) \quad N_D^+ = N_D \left[1 + \frac{1}{1 + \frac{1}{g} \exp\left(\frac{E_D - E_F}{kT}\right)} \right]$$

$$(3) \quad N_D^+ = N_D \left[1 + \frac{1}{g} \exp\left(\frac{E_D - E_F}{kT}\right) \right]$$

$$(4) \quad N_D = N_D^+ \left[1 + \frac{1}{g} \exp\left(\frac{E_F - E_D}{kT}\right) \right]$$

50. In intrinsic semi-conductor the number of occupied conduction band levels are

$$(1) \quad \int_0^{E_c} N(E) F(E) dE$$

$$(2) \quad \int_{E_c}^{E_{top}} N(E) F(E) dE$$

$$(3) \quad \int_{E_v}^{E_c} N(E) F(E) dE$$

$$(4) \quad \int_{E_c}^{E_v} N(E) F(E) dE$$

Space For Rough Work

