PAPER-III
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 : **2 ½** hours] [Maximum Marks : **150**

Number of Pages in this Booklet : **24**

Number of Questions in this Booklet : **75**

Instructions for the Candidates

1. Write your roll number in the space provided on the top of this page.
2. This paper consists of seventy five 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 पचहत्तर 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 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 ।**
   (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 चिह्नांकित 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 । हालांकि 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 प्वाईंट 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 हैं ।**

ELECTRONIC SCIENCE

PAPER – III

Note : This paper contains **seventy five (75)** objective type questions of **two (2)** marks each. **All** questions are compulsory.

1. In an n-MOS inverter to get the good levels (low & high)

(1) Resistance of load MOSFET >> Resistance of Driver MOSFET when conducting.

(2) Resistance of load MOSFET << Resistance of Driver MOSFET when conducting.

(3) Resistance of load MOSFET = Resistance of Driver MOSFET when conducting.

(4) Resistance of load MOSFET must be infinite.

2. In a CMOS inverter, if the driver MOSFET operating region is cutoff, then the output is given as

(1) V_{OL} (2) V_{OH}

(3) $V_{OH} - V_{OL}$ (4) $V_{OL} + V_{OH}$

3. The inverse z-transform of X(z) defined as $X(z) = z + 1 - 2z^{-1}$ will be

(1) $x[n] = \delta[n - 1] + \delta[n] + 2\delta[n - 1]$

(2) $x[n] = \delta[n + 1] + \delta[n] - 2\delta[n - 1]$

(3) $x[n] = \delta[n - 1] + \delta[n] - 2\delta[n + 1]$

(4) $x[n] = \delta[n + 1] + \delta[n] + 2\delta[n + 1]$

4. Fourier transform of a function $x(t)$ exists if

(1) $\int_{-T}^{T} x(t)\,dt$ exists (2) $\int_{-\infty}^{\infty} |x(t)|\,dt$ exists

(3) $\int_{-T/2}^{T/2} |x(t)|\,dt$ exists (4) $\int_{-\infty}^{\infty} |f(w)|\,dw$ exists

5. In a Schottky barrier diode the barrier height is

(1) $\frac{kT}{q}\ln\frac{N_A}{N_D}$ (2) $\frac{kT}{q}\ln\left(\frac{AA^{**}\,T^2}{I_S}\right)$

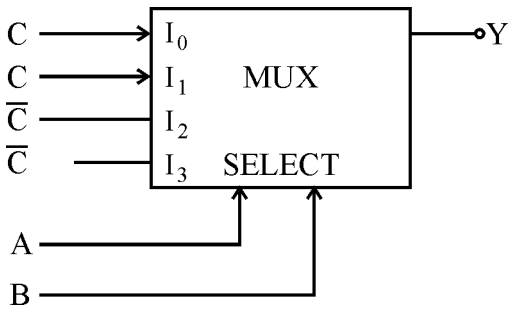
(3) $\frac{kT}{q}\ln\left(\frac{T^2}{I_S}\right)$ (4) $\frac{q\,N_A}{2\varepsilon_s}\ln\left(\frac{AA^*}{I_S}\right)$

6. In a bipolar junction transistor, the condition for thermal stability can be expressed as

(1) $\frac{\partial P_C}{\partial T_i} = \frac{\partial P_D}{\partial T_i}$ (2) $\frac{\partial P_C}{\partial T_i} \neq \frac{\partial P_D}{\partial T_i}$

(3) $\frac{\partial P_C}{\partial T_i} > \frac{\partial P_D}{\partial T_i}$ (4) $\frac{\partial P_C}{\partial T_i} < \frac{\partial P_D}{\partial T_i}$

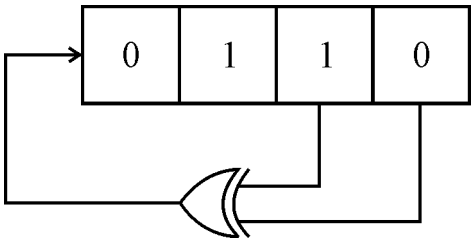
7. The output 'Y' of the multiplexer circuit shown below is given by



(1) $\bar{A}\bar{B}C + \bar{A}BC + A\bar{B}\bar{C} + AB\bar{C}$ (2) $AB + B\bar{C} + \bar{C}A + \bar{B}\bar{C}$

(3) $A \oplus B$ (4) $A \oplus B \oplus C$

8. The initial contents of the 4-bit serial in parallel out, right shift register shown below is 0110 :



After three clock pulses are applied, the contents of the shift register will be :

(1) 1010 (2) 1011

(3) 1101 (4) 1110

9. What will be the contents of register AL after the following has been executed ?

```
MOV BL, 8C
MOV AL, 7E
ADD AL, BL
```

(1) 0A and carry flag is set
(2) 0A and carry flag is reset
(3) 6A and carry flag is set
(4) 6A and carry flag is reset

10. Signal voltage ranges for a logic high and for a logic low in RS-232C standard are :

(1) Low = 0 Volt to 1.8 Volt, high = 2.0 Volt to 5 Volt
(2) Low = + 3 Volt to + 15 Volt, high = –3 Volt to –15 Volt
(3) Low = – 15 Volt to –3 Volt, high = +3 Volt to + 15 Volt
(4) Low = 2 Volt to 5.0 Volt, high = 0 Volt to 1.8 Volt

11. The following statements :

```
for (i = 3; i < 15; i + = 3)
{
   printf ("%d", i);
   + + i;
}
```

Will result in the printing of

(1) 3 7 11 15
(2) 3 6 9 12 15
(3) 3 6 9 12
(4) 3 7 11

12. Consider the following program fragment

```
if (a > b)
if (b > c)
S1;
else S2;
```

S2 will be executed if :

(1) a < = b
(2) a > b and b < = c
(3) b < = c and a < = b
(4) b > c

13. The spacing between the centres of two holes of a two hole directional coupler must be

(1) $(2n + 1)\frac{\lambda_g}{4}$ (2) $2n\frac{\lambda_g}{4}$

(3) $\frac{\lambda_g}{4}$ (4) $(2n - 1)\frac{\lambda_g}{2}$

14. In a Klystron when the electrons are first accelerated by the high d.c. voltage V_o, before entering the bunching grid, their velocity in m/s is

(1) $0.593 \times 10^6\sqrt{V_o}$ (2) $0.593\ V_o$

(3) $\sqrt{\frac{e}{m}V_o}$ (4) $\frac{kT}{q}\sqrt{\frac{e}{m}V_o}$

15. Four independent messages have bandwidths of 100 Hz, 100 Hz, 200 Hz and 400 Hz, respectively. Each is sampled at Nyquist rate, the samples are Time Division Multiplexed (TDM) and transmitted. The transmitted sample rate (in Hz) is

(1) 800 (2) 1600

(3) 400 (4) 3200

16. When receiver is tuned from one RF frequency to another

(1) the IF changes by an amount equal to local oscillator frequency.

(2) the IF remains the same.

(3) the LO frequency changes by an amount equal to the audio frequency.

(4) both the LO and the IF frequencies change.

17. When the electrons in a system move from excited state (E_2) to the lower energy state (E_1) causing spontaneous and stimulated emission of radiation both the ratio of the spontaneous to stimulated transitions is

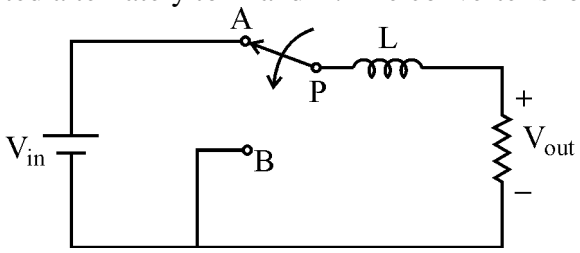
(1) $\frac{A_{21}}{B_{21}\,U_V} = 1 : 1$ (2) $\frac{A_{21}}{B_{21}\,U_V} = 1 : 2$

(3) $\frac{A_{21}}{B_{21}\,U_V} = \exp\left(\frac{h\nu}{k_B T}\right) - 1$ (4) $\frac{A_{21}}{B_{21}\,U_V} = 8\pi\frac{h\nu^3}{C^3}$

When U_V is energy density

A_{21} and B_{21} are Einstein's coefficient.

18. The power converter shown in figure has a single-pole double throw switch. The pole P of the switch is connected alternately to A and B. The converter shown is

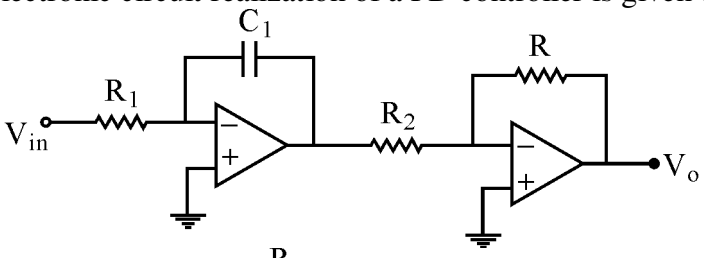


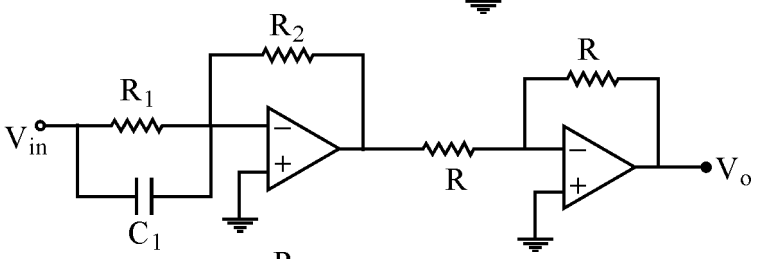
(1) Step-down chopper (Buch converter)
(2) Step-up chopper (Boost converter)
(3) Step-up & step-down both
(4) Neither Step-up nor Step-down

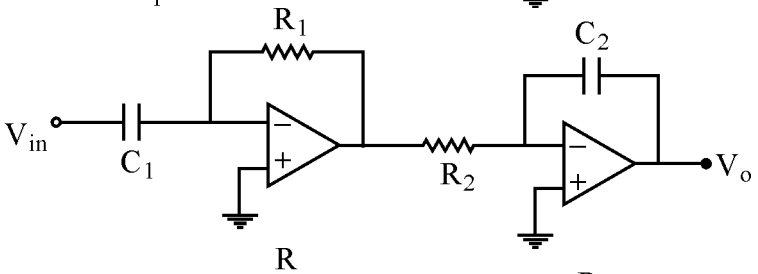
19. If μ is Poisson's ratio, E is Young's modulus and η is piezo-resistive coefficient, then the gauge factor (G) for the semiconductor strain gauge is given by the equation

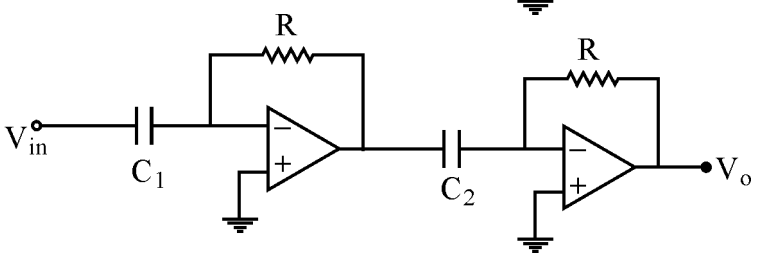
(1) $G = 1 - 2\mu + \eta E$ (2) $G = 1 + 2\mu - \eta E$
(3) $G = 1 + 2\mu + \eta E$ (4) $G = 1 - 2\mu - \eta E$

20. The electronic circuit realization of a PD controller is given by

(1)


(2)


(3)


(4)


21. In a bipolar junction transistor which of the following are correct ?

(a) For a particular amplifier, smaller the internal resistance of the signal source, the greater is the overall gain.

(b) For a particular design, the larger the level of R_L, the greater is the level of a.c. gain.

(c) For a particular amplifier, larger the internal resistance of the signal source, the greater is the overall gain.

(d) For a particular amplifier, smaller the internal resistance of the signal source, the smaller is the overall gain.

Out of these which is correct ?

(1) (a) and (c) are correct (2) (a) and (d) are correct

(3) (a) and (b) are correct (4) (c) and (d) are correct

22. For each transistor configuration, the current gain can be given as :

(a) $-\frac{V_0}{V_i}\frac{Z_i}{R_L}$ (b) $-A_{V_L}\frac{Z_i}{R_L}$

(c) $\frac{V_i}{V_o}R_L$ (d) $A_{V_L} \cdot R_L$

(1) (a) and (b) are correct (2) (a) is correct, but (b) is wrong

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

23. Read the following statements :

(a) Bode plot is also called a logarithmic plot.

(b) Bode plot is used to find the stability of a control system using frequency response.

(c) Bode plot is used to find the stability of a control system using time response.

(d) Bode plot consists of only a magnitude plot.

Which of the above statements are not correct ?

(1) (a) and (b) (2) (b) and (c)

(3) (c) and (d) (4) (a) and (c)

24. Read the following statements regarding filters :

(a) A notch filter has only one cut-off frequency.

(b) A notch filter has two cut-off frequencies.

(c) A band pass filter does not have two cutoff frequencies.

(d) A high pass filter has only one cutoff frequency.

Which of the above are correct ?

(1) (a) and (d) (2) (b) and (d)

(3) (a) and (c) (4) (b) and (c)

25. The total change in the collector current due to net change in temperature can be expressed as

(a) $\frac{\partial I_C}{\partial I_{CO}} . \Delta I_{CO}$

(b) $\frac{\partial I_C}{\partial \beta} . \Delta I_{CO} + \frac{\Delta I_C}{\partial V_{BE}} . \Delta I_{CO}$

(c) $\frac{\partial I_C}{\partial I_{CO}} . \Delta I_{CO} + \frac{\partial I_C}{\partial \beta} . \Delta \beta + \frac{\partial I_C}{\partial V_{BE}} . \Delta I_{CO}$

(d) $\frac{\partial I_C}{\partial I_{CO}} . \Delta I_{CO} + \frac{\partial I_C}{\partial \beta} . \Delta \beta + \frac{\partial I_C}{\partial V_{BE}} . \Delta V_{BE}$

Out of these which are correct ?

(1) (a) is correct and (b) is wrong. (2) (d) is correct and (c) is wrong.

(3) (b) and (c) are correct. (4) (d) is wrong but (a) is correct.

26. For the halfwave rectifier circuit, I_{dc} is given as

(a) $\frac{I_m}{\pi}$ (b) $\frac{2I_m}{\sqrt{2}\pi}$

(c) $\frac{1}{2\pi} \int_0^{\pi} I_m \sin \omega t$ (d) $\frac{1}{2\pi} \int_0^{2\pi} I_m \sin \omega t$

Out of these

(1) (a) and (c) are correct (2) (a) and (d) are correct

(3) (b) and (c) are correct (4) (c) and (d) are correct

27. For clocked sequential circuits following statements are given :

(a) The speed of operation depends on the maximum allowed clock frequency.

(b) The memory elements are latches or gate circuits with feedback producing the latch operation.

(c) In sequential circuits, any number of inputs can change simultaneously (during the absence of the clock)

(d) The input can change any time, in sequential circuits.

Out of the above which are correct ?

(1) (a), (b) and (d) (2) (a) and (c)

(3) (b), (c) and (d) (4) (c) and (d)

28. JK flip-flop has previous output = 1, In a JK flipflop, for making output at level 1, following statements are given :

(a) J = 0, K = 0 (b) J = 1, K = 0

(c) J = 0, K = 1 (d) J = 1, K = 1

Out of the above which statements are correct :

(1) (c) and (d) (2) (b) and (c)

(3) (a) and (b) (4) (a) & (d)

29. In virtual memory system, the address space specified by the address lines of the CPU must be :

(a) smaller than the physical memory size

(b) larger than the physical memory size

(c) larger than the secondary storage size

(d) smaller than the secondary storage size

Which of the above statements are correct ?

(1) (a) and (b) (2) (b) and (c)

(3) (b) and (d) (4) (a) and (d)

30. A sequence of two instructions that multiplies the contents of the DE register pair by 2 and stores the result in the HL register pair (in 8085 assembly language) is

(a) XCHG (b) DAD B

(c) XTHL (d) DAD H

Option :

(1) (a) followed by (b) (2) (c) followed by (d)

(3) (a) followed by (d) (4) (c) followed by (b)

31. Inline function in C++

(a) decreases the code size

(b) increases the code size

(c) speeds up execution

(d) slows down execution

Which of the above statements are correct ?

(1) (a) and (c) (2) (a) and (d)

(3) (b) and (c) (4) (b) and (d)

32. Let 'a' be an array. Which of the following cannot be present in the left-hand side of an assignment statement ?

(a) a (b) a + i

(c) & a[i] (d) *(a + i)

Which of the following statements are correct ?

(1) (b) and (d) (2) (b), (c) and (d)

(3) (a), (b) and (c) (4) (a), (b) and (d)

33. Isolator is

(a) used as to protect the source

(b) used to provide free transmission

(c) a two port device

(d) a four port device

Out of the above, following is correct :

(1) (a) and (c) (2) (b) and (c)

(3) (a) and (d) (4) (a), (b) and (c)

34. The general solution of the transmission line equations consist of two waves travelling in opposite directions with unequal magnitude of $V_+e^{-az}\ e^{-j\beta z}$ and $V_-\ e^{az}\ e^{j\beta z}$. The resultant amplitude is

(a) $(V_+e^{-az} + V_-e^{-az})\cos\beta z - j\,(V_+e^{-az} - V_-e^{az})\sin\beta z$

(b) $V_+e^{-az}\ e^{-j\beta z} + V_-\ e^{az}\ e^{j\beta z}$

(c) $V_+e^{-az}\ e^{-j\beta z} - V_-\ e^{az}\ e^{j\beta z}$

(d) $(V_+e^{-az} - V_-e^{-az})\cos\beta z + j\,(V_+e^{-az} - V_-e^{az})\sin\beta z$

Out of these the correct is

(1) (a) and (b) are correct

(2) (a) and (c) are correct

(3) (b) and (d) are correct

(4) (c) and (d) are correct

35. Which of the below mentioned statements are incorrect ?

(a) The Fourier series of a non-periodic function consists summation of harmonics of fundamental frequency.

(b) When sinusoidal excitation is applied to a linear system, the response is also sinusoidal and has the same frequency as the excitation.

(c) The Fourier series of a periodic function consist summation of harmonics of fundamental frequency.

(d) When sinusoidal excitation is applied to a linear system, the response is also sinusoidal, however, there is a change in the frequency of excitation.

(1) (a) & (b) (2) (b) & (c)

(3) (a) & (d) (4) (c) & (d)

36. Which of the following statements are correct ?

(a) Digital communication systems use less bandwidth than equivalent analog systems.

(b) Signal to noise ratio for PCM or delta modulation can often be improved by using companding.

(c) Passband transmission is used for transmission of digital message in the high frequency range.

(d) Delta modulation needs lower sampling rate than PCM for equivalent results.

(1) (a) and (d) are correct (2) (b) and (d) are correct

(3) (b) and (c) are correct (4) (a) and (c) are correct

37. Attenuation in optical fibres can be caused due to the following reasons :

(a) Rayleigh scattering caused due to structural imperfections in the fibre material.

(b) Axial misalignment occurs while connecting fibre to fibre.

(c) Use of different modes (step or graded) of operation.

(d) Due to the use of cladding in the construction of optical fibre.

(1) (b) and (c) are correct. (2) (b) and (d) are correct.

(3) (a) and (c) are correct. (4) (a) & (b) are correct.

38. Which of the following statements are true for UJT ?

(a) To turn a UJT ON, the forward bias on emitter diode should be more than the peak point voltage.

(b) When the emitter lead of UJT is open, the resistance between its two base is infinite.

(c) When a UJT is turned ON, the resistance between emitter and base 1 is increased.

(d) When input positive voltage to the emitter of UJT exceeds the peak point voltage, the emitter current quickly reaches to saturation current.

Option :

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

(3) (a), (b) and (d) are correct (4) (a) and (d) are correct

39. Read the following statements regarding signal analysis :

(a) The dynamic response of the structure is measured by vibration transducers.

(b) The frequency at which the system resonates can be determined.

(c) The dynamic response of the structure cannot be measured by vibration transducers.

(d) The frequency at which the system resonates is always zero.

Which of the above are correct ?

(1) (a) and (b) (2) (b) and (c)

(3) (c) and (d) (4) (a) and (c)

40. Read the following statements :

(a) A decrease in the value of time constant of a control system indicates that the steady state reaches earlier.

(b) An increase in time constant of a control system indicates that the steady state reaches earlier.

(c) Lower is the time constant faster is the time response of the system.

(d) Higher is the time constant, faster the time response of the system.

Which of the above statements are correct ?

(1) (a) and (b) (2) (b) and (c)

(3) (a) and (c) (4) (a) and (d)

41. Match the following :

List – I		**List – II**
a. UJT	i.	$-\frac{1}{RC}\int v dt$
b. BJT	ii.	$\frac{A}{1 - A\beta}$
c. Feedback Amplifier	iii.	$-\frac{h_{fe} R_L}{h_{ie}}$
d. Op-Amp	iv.	$\frac{R_{B1}}{R_{B1} + R_{B2}}\Big\vert_{I_{E=0}}$

Codes :

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

42. Match the following lists :

List – I **(Signal)**		**List – II** **(Fourier Transform)**
a. $x(t + t_o)$	i.	$\frac{1}{\vert a \vert} \times \left(\frac{\omega}{a}\right)$
b. $x(t - t_o)$	ii.	$\frac{1}{a} \times \left(\frac{\omega}{a}\right)$
c. $x(at)$; $a > 0$	iii.	$e^{-j\omega t_o} X(\omega)$
d. $x(at)$; $a < 0$	iv.	$e^{j\omega t_o} X(\omega)$

Codes :

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

43. Match the following :

	List – I		**List – II**
a.	Fullwave rectifier	i.	$\text{Reep}\left[\frac{-\Delta E}{kT_e}\right]$
b.	p-n junction diode	ii.	$g_{do}\left[1-\left(\frac{V_{as}}{V_p}\right)^{1/2}\right]$
c.	Gunn diode	iii.	$\frac{\pi}{2\sqrt{2}}$
d.	JFET	iv.	$Aq\left(\frac{D_P}{L_P N_D}+\frac{D_n}{L_n N_A}\right)n_z^2$

Codes :

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

44. Match the following lists in terms of speed of Logic families :

	List – I		**List – II**
a.	Bipolar TTL (F)	i.	10 ns
b.	CMOS (AHC)	ii.	0.22 ns
c.	Bipolar (ECL)	iii.	3.7 ns
d.	TTL (LS)	iv.	3.3 ns

Codes :

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

45. Match the following in the context of 8086 :

List – I		**List – II**	
a.	Linker	i.	Program which allows to create a file containing the assembly language statements for program.
b.	Locator	ii.	Program used to join several object files into one large object file.
c.	Editor	iii.	Program which allows to load object code program into system memory.
d.	Debugger	iv.	Program used to assign the specific addresses of where the segments of object code are to be loaded into memory.

Codes :

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

46. Match the following in the context of C :

List – I		**List – II**	
a.	&	i.	Logical operator
b.	=	ii.	Assignment operator
c.	&&	iii.	Relational operator
d.	= =	iv.	Bitwise AND operator

Codes :

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

47. Match the following lists with reference to parameters of transmission line :

	List – I		**List – II**
a.	Inductance of parallel wire line	i.	$\frac{\mu_0}{2\pi} \ln (b/a)$
b.	Inductance of coaxial line	ii.	$2\pi/\lambda$
c.	Phase shift	iii.	$\frac{1}{\sqrt{LC}}$
d.	Phase velocity	iv.	$\frac{\mu_0}{\pi} \ln (b/a)$ for $b >> a$

Codes :

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

48. Match the following lists :

	List – I		**List – II**
a.	P_{AM}	i.	$P_C\left(\frac{m^2}{2}\right)$
b.	P_{DSBSC}	ii.	$P_C\left(\frac{m^2}{4}\right)$
c.	P_{VSB}	iii.	$F\left(\frac{m^2}{4} P_C\right) + \frac{m^2}{4} P_C$
d.	P_{SSB}	iv.	$P_C\left(1 + \frac{m^2}{2}\right)$

Codes :

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

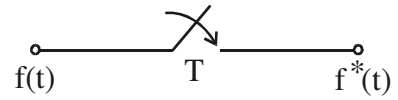
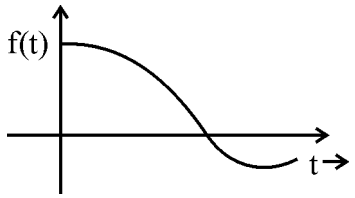
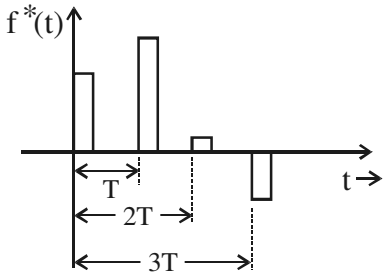
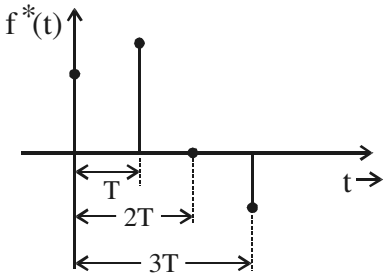
49. Match the role as per List – II of the below mentioned parts (List – I) of the optical fibre communication setup :

List – I		**List – II**	
a.	LED/LASER	i.	Joining of two optical fibres
b.	p-i-n photodiode/avalanche photodiode	ii.	Terminates the ends of the optical fibre
c.	Optical fibre splicing	iii.	Accepts fibre output to their input
d.	Optical Fibre connectors	iv.	Couple output power to the fibre

Codes :

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

50. Match the following lists :

List – I		**List – II**	
a.		i.	Practical sampling
b.		ii.	Ideal sampling
c.		iii.	Sampler
d.		iv.	Continuous signal

Codes :

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

51. Arrange the following in descending order of input impedances :

(a) Transistor in CE stage

(b) Transistor in CC stage

(c) Op-Amp

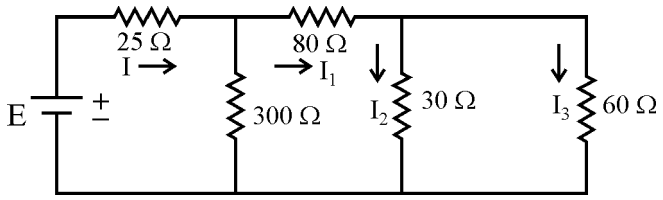
(d) Darlington pair

The correct sequence is given by :

(1) (c), (d), (b), (a) (2) (c), (d), (a), (b)

(3) (d), (c), (a), (b) (4) (c), (b), (d), (a)

52. Consider the following circuit :



Given that

(a) Current I in 25 Ω resistor (b) Current I_1 in 80 Ω resistor

(c) Current I_2 in 30 Ω resistor (d) Current I_3 in 60 Ω resistor

Arrange the above in increasing order of the currents :

(1) (a), (b), (c), (d) (2) (b), (c), (d), (a)

(3) (d), (b), (c), (a) (4) (d), (c), (b), (a)

53. Following are the materials used in Fabrication of semiconductors. Arrange them in descending order of their mobilities of electrons :

(a) In Sb (b) Si

(c) In P (d) Ga As

The correct sequence in descending order is

(1) (a), (d), (c), (b) (2) (a), (b), (d), (c)

(3) (b), (c), (d), (a) (4) (d), (b), (c), (a)

54. Arrange the following in ascending order of Noise margin :

(a) TTL (b) ECL

(c) CMOS (d) MOS

The correct sequence in ascending order is

(1) (c), (a), (b), (d) (2) (d), (b), (c), (a)

(3) (a), (b), (c), (d) (4) (b), (a), (d), (c)

55. Following are the PIN signals of 8086 μP

(a) READY (b) MN/ $\overline{MX}$

(c) CLK (d) $\overline{TEST}$

Arrange them in ascending order of their Pin No. The correct option is :

(1) (c), (a), (d), (b) (2) (a), (c), (b), (d)

(3) (d), (a), (c), (b) (4) (b), (d), (a), (c)

56. An expression contains the following operators without parenthesis :

(a) > (greater than operator) (b) & (bit-wise AND operator)

(c) > > (right shift operator) (d) + + (increment operator)

Arrange them in the order they are evaluated. The correct option is :

(1) (a), (c), (d), (b) (2) (d), (c), (a), (b)

(3) (d), (c), (b), (a) (4) (b), (d), (c), (a)

57. Arrange the following in ascending order of wavelength :

(a) X-rays (b) X-baud

(c) L baud (d) UHF

The correct order of sequence is :

(1) (d), (c), (b), (a) (2) (c), (b), (a), (d)

(3) (d), (b), (c), (a) (4) (a), (b), (c), (d)

58. Arrange the various amplitude modulated waveforms in order their decreasing power requirements :

(a) Vestigial Side Band Transmission (VSB)

(b) Single Side Band (SSB)

(c) Double Side Band Full Carrier (DSBFC)

(d) Double Side Band Carrier Suppressed (DSBCS)

(1) (c), (d), (b) & (a) (2) (c), (d), (a) & (b)

(3) (c), (a), (d) & (b) (4) (a), (b), (d) & (c)

59. Arrange the below mentioned materials based LEDs in order of their increasing wavelengths

(a) Gallium Arsenide (GaAs)

(b) Gallium Phosphide (GaP)

(c) Aluminium Nitride (A*l*N)

(d) Aluminium Gallium Nitride (AlGaN)

(1) (c), (d), (b) & (a) (2) (a), (c), (b) & (d)

(3) (c), (a), (b) & (d) (4) (a), (b), (c) & (d)

60. The open loop transfer function of a unity feedback control system is given by

$$G(s) = \frac{25}{s(s + 5)}$$

Consider that

(a) natural frequency of oscillations

(b) damped frequency of oscillations

(c) damping factor

(d) damping ratio

Arrange the above in increasing order of their numerical values :

(1) (d), (a), (b), (c) (2) (a), (b), (d), (c)

(3) (d), (c), (b), (a) (4) (a), (c), (d), (b)

Directions : Questions No. **61 – 70 :**

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 you 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.

61. **Assertion (A) :** In varacter diode, the barrier capacitance is not constant but it varies with applied voltage.

Reason (R) : The larger the value of reverse voltage, the larger is the space charge width and hence smaller is the capacitance of the barrier.

62. **Assertion (A) :** In a network tree the number of branches are always one less than the number of nodes in the tree irrespective of the complexity of the network tree.

Reason (R) : A tree of a connected graph is a circuitless subgraph of n nodes and (n – 1) branches.

63. **Assertion (A) :** The dependence of output current on temperature is given by equation

$$I_o = kT^m \exp(+V/\eta V_T)$$

Where k, is a constant

For Ge $\eta = 2$, $m = 1.5$

For Si $\eta = 1$, $m = 2$

Reason (R) : Experimentally reverse saturation current increases approximately 7% per °C for both Si and Ge.

64. **Assertion (A) :** Resolution and accuracy are important aspects to evaluate the performance of a D to A converter.

Reason (R) : Resolution defines the largest increment in voltage that can be discerned, where as the accuracy is the measure of how far the actual output voltage is away from theoretical output.

65. **Assertion (A) :** In Intel 8085, the lower byte of address and data are multiplexed.

Reason (R) : This helps to limit the number of external pin terminals.

66. **Assertion (A) :** If you want that the value of an actual argument should not get changed in the function being called, pass the actual argument by value.

Reason (R) : Because the addresses of actual argument and dummy argument are different.

67. **Assertion (A) :** When both transmitting and receiving antennas are located at the surface of earth. There is a transmission through ground reflected waves only and there is no surface wave.

Reason (R) : When the antennas are elevated, the space wave component is non-zero and the resultant signal at the receiver is the vector sum of space and surface waves.

68. **Assertion (A) :** A trade off between transmitted power and channel bandwidth is used in digital modulation techniques namely Amplitude Shift Keying (ASK), Frequency Shift Keying (FSK) and Phase Shift Keying (PSK).

Reason (R) : The trade off is to meet the requirement of optimal utilization of transmitted power and channel bandwidth.

69. **Assertion (A) :** Satellite Earth Stations are located in Noise-free Valleys and Radio Telescopes are always located away from industry.

Reason (R) : This makes the operation of these setups free from any kind of noise.

70. **Assertion (A) :** Rise time and delay time are inversely proportional to undamped frequency.

Reason (R) : Increasing the damping ratio will increase the rise time and delay time.

Read the passage and answer the following questions from **71** to **75 :**

Since Maxwell's fundamental concept of electromagnetic wave theory, the electric and magnetic wave equations can readily be derived from Faraday's electromotive force law, Ampere's circuital law and Gauss's law for electric and magnetic fields. Many topics associated with electromagnetic wave, such as Poynting theory, Reflection theory, attenuation concept and plane wave propagation in metallic film coating on plastic substrate can be analysed. The principle of electromagnetic plane waves are based on the relationships between electricity and magnetism. A changing magnetic field will induce an electric field and changing electric field will induce the magnetic field. The induced fields are not confined but ordinarily extend outward into space. The sinusoidal form of the wave causes energy to be interchanged between magnetic and electric fields in the direction of the wave propagation. In the far field of free space, electric and magnetic waves are always perpendicular to each other.

71. One of the Maxwell's equation in frequency domain is

(1) $\nabla \times \vec{H} = -j\omega\mu\vec{H}$ (2) $\nabla \times \vec{E} = -j\omega\mu H$

(3) $\nabla \times \vec{E} = (\sigma + j\omega t)\vec{E}$ (4) $\nabla \times \vec{H} = (\sigma + j\omega E)\vec{H}$

72. The electric wave equation in the time domain is

(1) $\nabla^2\vec{E} = \mu\sigma\frac{\partial\vec{E}}{\partial t} - \mu\in\frac{\partial^2\vec{E}}{\partial t^2}$ (2) $\nabla^2\vec{E} = \mu\sigma\frac{\partial\vec{H}}{\partial t} + \mu\in\frac{\partial^2\vec{E}}{\partial t^2}$

(3) $\nabla^2\vec{E} = \mu\sigma\frac{\partial\vec{E}}{\partial t} + \mu\in\frac{\partial^2\vec{E}}{\partial t^2}$ (4) $\nabla^2\vec{E} = \mu\sigma\frac{\partial\vec{H}}{\partial t} + \mu\in\frac{\partial^2\vec{E}}{\partial t^2}$

73. The ratio of electric to magnetic intensities is given by

(1) $\sqrt{\frac{\mu_0}{\in_0}}$ (2) $\sqrt{\frac{\in_0}{\mu_0}}$

(3) $\sqrt{\mu_0 \in_0}$ (4) $\frac{C}{\sqrt{\mu_0 \in_0}}$

74. For boundary conditions at the surface between two different materials, the number of basic rules are

(1) 3 (2) 2

(3) 4 (4) 1

75. The propagation constant of a plane wave for a poor conductor is

(1) $\sqrt{j\omega\mu\,(\sigma + j\omega\in)}$ (2) $\sqrt{j\omega\sigma\,(\mu + j\omega\in)}$

(3) $j\omega\,(\sigma\mu + \sigma\in)$ (4) $\sqrt{j\omega\mu\,(\sigma - j\omega\in)}$

Space For Rough Work