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 0 8 8 1 8

PAPER - II
ELECTRONIC SCIENCE

Time : 2 hours] **[Maximum Marks : 200**

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

Number of Questions in this Booklet : **100**

Instructions for the Candidates

1. Write your roll number in the space provided on the top of this page.
2. This paper consists of hundred 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 on conclusion of examination.
10. **Use only Blue/Black Ball point pen.**
11. **Use of any calculator or log table etc., is prohibited.**
12. **There are 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 सौ 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 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 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 अपने साथ ले जा सकते हैं।
10. **केवल नीले/काले बाल प्वाईंट पेन का ही प्रयोग 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 - II

Note : This paper contains **hundred (100)** objective type questions of **two (2)** marks each. **All** questions are **compulsory**.

1. The simple one dimensional diffusion process can be given by :

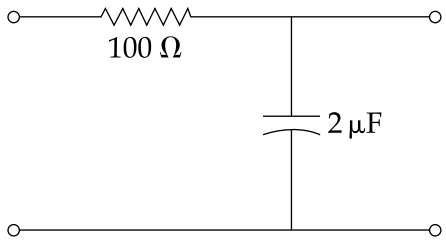
(1) $\frac{\partial c\,(x,t)}{\partial t} = D\,\frac{\partial c}{\partial x}\,(x,\,t)$ (2) $\frac{\partial^2 c\,(x,\,t)}{\partial t^2} = D\,\frac{\partial^2 c}{\partial x^2}\,(x,\,t)$

(3) $\frac{\partial c\,(x,\,t)}{\partial t} = D\,\frac{\partial^2 c}{\partial x^2}\,(x,\,t)$ (4) $\frac{\partial^2 c\,(x,\,t)}{\partial t^2} = D\,\frac{\partial c}{\partial x}\,(x,\,t)$

2. In an intrinsic semiconductor, the intrinsic carrier density is :

(1) $N_c N_v\, e^{\frac{-Eg}{2kT}}$ (2) $\sqrt{N_c\,N_v}\; e^{\frac{-Eg}{kT}}$ (3) $\sqrt{N_c N_v}\; e^{\frac{-Eg}{2kT}}$ (4) $\sqrt{N_c N_v}\; e^{\frac{+Eg}{kT}}$

3. The frequency at which the transfer function $|H(\omega)|$ of the following RC network is $\frac{1}{2}$, will be :

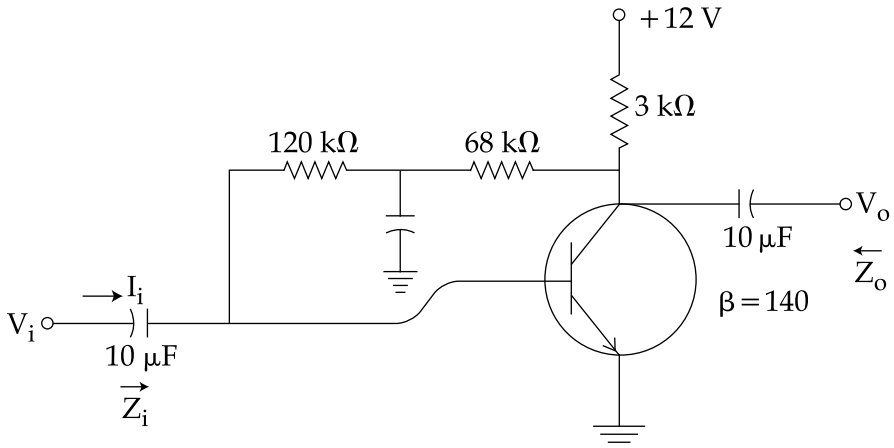


(1) 50 Hz (2) 200 Hz (3) 1900 Hz (4) 1378 Hz

4. The Laplace transform of a signal f(t) is given as ; $F(s) = \frac{5s+3}{s(s+1)}$. The signal will be :

(1) $2u(t) + 3e^{-t}$ (2) $3u(t) - 2e^{-t}$ (3) $3u(t) + 2e^{-t}$ (4) $2u(t) - 3e^{-t}$

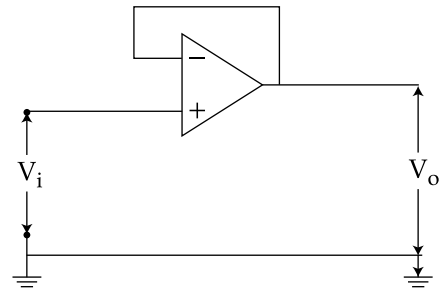
5. In a circuit shown below, the base current I_B is :



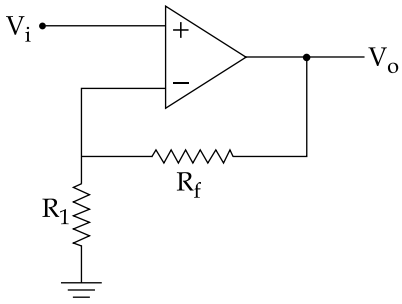
(1) 18.58 μA (2) 19.73 μA (3) 60.10 μA (4) 2.63 μA

6. The unity follower circuit is :

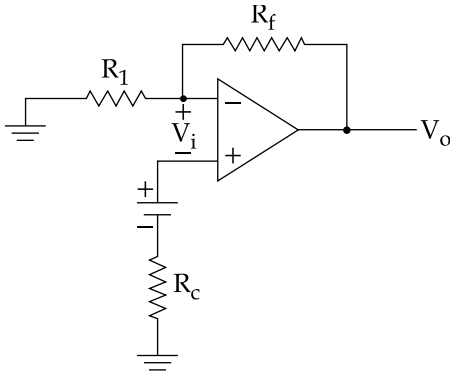
(1)



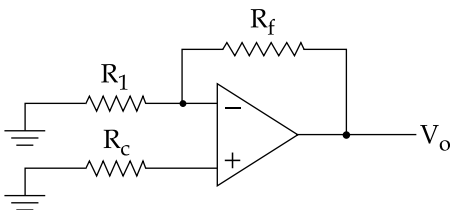
(2)



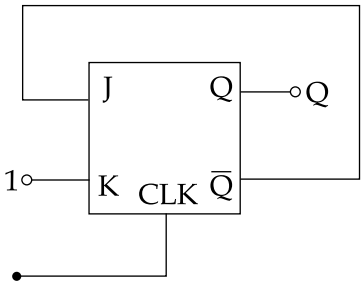
(3)



(4)



7. The advantage/disadvantage of Schottky TTL logic circuit over Standard TTL logic circuit is that :
(1) It provides low power consumption
(2) It virtually eliminates saturation delay time
(3) It provides simple circuitary
(4) It gives low switching speed

8. 

In a J-K flip-flop we have $J=\overline{Q}$ and $K=1$ (shown in figure). Assuming the flip-flop was initially cleared and clocked for 6 pulses, the sequence at the Q output will be :
(1) 010000 (2) 011001 (3) 010010 (4) 010101

9. In which of the following number systems, AC flag is used in 8085 μp ?
(1) Octal (2) BCD (3) Binary (4) Hexadecimal

10. JMP 2034H in 8085 μp is an example of _____.
(1) 1 byte instruction (2) 2 byte instruction
(3) 3 byte instruction (4) None of the above

11. Which of the following is the correct output for the 'C' program given below :

```
#include<stdio.h>
void afun(char *) ;
int main( )
{
    char ch[10] ;
    ch[0]='X' ; ch[1]='Y' ; ch[2]='Z' ;
    ch[3]='W' ;
    afun (& ch[0]) ;
    return 0 ;
}
void afun (char *c)
{
        c++ ;
        printf("%c", *c) ;
        c++ ;
        printf("%c\n", *c) ;
}
```

Correct output is :
(1) XY (2) YZ
(3) ZW (4) None of the above

12. Consider the following expression in 'C'

$8+9/3*3-4+9\%6$;

which evaluates to :

(1) 10 (2) 8 (3) 14 (4) 16

13. Which of the following statements in FORTRAN is non-executable statement ?

(1) DO (2) FORMAT (3) IF (4) READ

14. A TRAPATT diode has the following parameters :

Doping concentration $= 2 \times 10^{15}\ cm^{-3}$

Current density $= 20\ KA/cm^2$

The avalanche zone velocity of carriers is given by :

(1) $2.25 \times 10^5\ m/s$ (2) $6.25 \times 10^7\ cm/s$

(3) $6.25 \times 10^3\ m/s$ (4) $2.35 \times 10^8\ m/s$

15. The Loading is sometimes used with an antenna in order to increase the :

(1) Bandwidth (2) Beam width

(3) Effective height (4) Input capacitance

16. Thermal noise is passed through an ideal low-pass filter having cut-off at $f_c = \omega$ Hz. The auto-correlation value of the noise at the output of the filter is given as :

(1) A delta function at $t = 0$

(2) Gaussian over the range $-\infty \le t \le \infty$

(3) Sinc function over the range $-\infty \le t \le \infty$

(4) Triangular function over the range $-\frac{1}{2}\omega \le t \le \frac{1}{2}\omega$

17. Which of the following statement is **correct** ?

(1) MF radio frequency waves are called long waves and HF are called short waves.

(2) VLF and LF radio frequency waves are called long waves while HF waves are called short waves.

(3) ELF radio waves are called long waves and HF are called short waves.

(4) LF radio waves are called long waves and VHF are called short waves.

18. A single mode fiber with radius of 4.2 μm, with core-refractive index $= 1.48$ and that of cladding $= 1.475$, the cut-off wavelength is given by :

(1) $\lambda_C = 1334$ nm (2) $\lambda_C = 1525$ nm (3) $\lambda_C = 990$ nm (4) $\lambda_C = 1290$ nm

19. A thermostatic cut-out works on the principle of :

(1) Thermal expansion of fluids

(2) Expansion due to air pressure

(3) Variation of resistance with temperature

(4) Thermal expansion of metals

20. If h is the Hydrogen ion concentration in gm/l, the pH value is given as :

(1) $\log h$ (2) $-\log h$ (3) $\log (1+h)$ (4) $\log \frac{1}{(1+h)}$

21. In a JFET, the maximum value of transconductance g_m is :

(1) $\frac{I_{DSS}}{|V_P|}$ (2) $\frac{2I_{DSS}}{|V_P|}$ (3) $\sqrt{\frac{2I_{DSS}}{|V_P|}}$ (4) $\sqrt{\frac{I_{DSS}}{|V_P|}}$

22. The cut-off frequency of TEM wave is :

(1) Zero (2) 11.0 GHz (3) ∞ (4) Moderate

23. Limiter circuit is not needed in the following detector :

(1) Foster - Seeley discriminator (2) Balanced slope

(3) Ratio detector (4) None

24. Which of the following is used to analyze all kind of matters ?

(1) Spectrophotometers (2) Electron Microscope

(3) X-ray diffractometer (4) Spectrum analyzer

25. In a Silicon oxidation model, if h_G is the gas phase mass transfer co-efficient, C_G is the oxidant concentration in the bulk of the gas and C_S is the oxidant concentration adjacent to the oxide surface, then for steady state, the gas phase flux can be expressed as :

(a) $\frac{(C_S - C_G)}{h_G}$ (b) $\frac{(C_G - C_S)}{h_G}$ (c) $h_G (C_G - C_S)$ (d) $h_G (C_S - C_G)$

of these statements.

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

(2) (b) is correct but (d) is wrong

(3) (c) is correct but (a) is wrong

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

26. When acceptor impurities of concentration N_A are added to a semiconductor crystal, when n is the electron density in the conduction band and p is the hole density in the valence band, the ionised acceptors are given as :

(a) $\frac{N_A}{1+4\exp\left(\frac{E_A-E_F}{kT}\right)}$ (b) $\frac{N_A}{1-4\exp\left(\frac{E_A-E_F}{kT}\right)}$

(c) $\frac{N_A}{1+4\exp\left(\frac{E_D-E_F}{kT}\right)}$ (d) $\frac{N_A}{1-2\exp\left(\frac{E_D-E_F}{kT}\right)}$

of these statements :

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

27. Which of the following statements are correct for the A/D converters :

(a) The advantage of using a dual slope A/D converter in a digital voltmeter is that its accuracy is high.
(b) The number of comparators in a 4-bit flash A/D converters is 15.
(c) The minimum number of comparators required to built an 8-bit flash A/D converter is 256.
(d) The number of comparators required in a 3-bit comparator type A/D converters is 8.

Options :

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

28. Which of the following statements are **correct** ?

(a) CMOS has higher speed and smaller power than BJT.
(b) CMOS ICs inputs should never be left unconnected as it may damage the device.
(c) CMOS ICs with Schmitt trigger inputs are useful for better noise immunity.
(d) CMOS is most popular logic family in VLSI Technology.

Options :

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

29. Which of the following statements are correct in respect to 8086 μp ?

(a) The instruction queue size is 8 bytes

(b) Segment register size is 16 bit while physical address size is 20 bits

(c) Segments are disjoint

(d) Beginning address of a segment must be divisible by $(16)_{10}$

The **correct** answer is :

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

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

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

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

30. What happens when RET statement is executed in 8085 μp ?

(a) Program counter is cleared

(b) Control is transferred from the subroutine to the main program

(c) Returning address is loaded into the accumulator

(d) Returning address is loaded into the program counter from the top of the stack

The **correct** answer is :

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

31. If 'a' is declared as one-dimensional array in 'C' then

(a) $*(a+i)$ is same as $*(\&a[i])$

(b) $*(a+i)$ is same as $*a+i$

(c) $\&a[i]$ is same as $a+i-1$

(d) $*(a+i)$ is same as $a[i]$

Which of the above statements are **incorrect** ?

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

32. Which of the following specifiers in C++ need not be honored by the compiler ?

(a) static (b) inline (c) extern (d) register

Which of the following is **correct** ?

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

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

33. Which of the following statements are **true** in case of Pulse Code Modulation (PCM) ?

(a) If the number of bits per sample is increased from n to n+1 ; the $\frac{S}{N_q}$ ratio would be 6 dB

(b) The quantization noise depends on sampling rate

(c) The main advantage of PCM is that it possesses better performance in presence of noise

(d) If the number of quantization levels increases from 4 to 64, the bandwidth increase by a factor of 4

Options :

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

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

34. The following statements are **correct** for DSB-SC signal :

(a) It is a low pass filter

(b) It needs minimum transmitted power

(c) It is a result of product modulator

(d) Bandwidth of DSB-SC is twice the maximum frequency

Options :

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

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

35. In an abrupt p-n junction if $N_A << N_D$, then the barrier potential is :

(a) $\frac{qN_D}{2\epsilon_s}W$ (b) $\frac{qN_A}{2\epsilon_s}W^2$ (c) $\frac{qN_D}{2\epsilon_s}W^2$ (d) $\frac{q(N_A)}{2\epsilon_s}W$

of these statements :

(1) (a) is correct but (c) is wrong

(2) (b) is correct but (d) is wrong

(3) (c) is correct but (a) is wrong

(4) (d) is correct but (b) is wrong

36. In a voltage series feedback amplifier with load R_L, if R_i is the input resistance without feedback, then the input resistance with feedback is :

(a) $R_i(1+\beta Av)$ (b) $R_i(1-\beta Av)$ (c) $\frac{R_i}{1+\beta A_v}$ (d) $\frac{R_i \beta A_v}{R_L}$

of these statements :

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

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

37. Magnetron is a :

(a) O - type tube

(b) a low power device

(c) a high power device

(d) an oscillator

Out of the above following is **correct** option :

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

38. A Travelling Wave Tube Amplifier (TWTA) has the following properties :

(a) It provides an octave Bandwidth

(b) It provides an approximate gain of 40dB and more

(c) It has a low noise figure

(d) It has a very high noise figure

Out of the above statements following is **correct** :

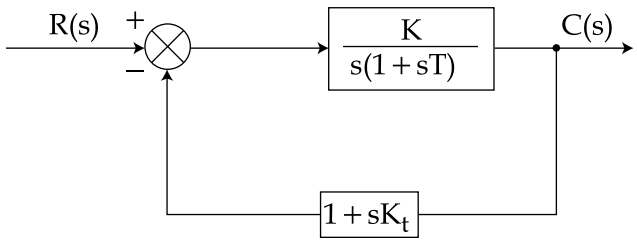
(1) (a), (b) and (d) only

(2) (a) and (d) only

(3) (a) and (b) only

(4) (a) and (b) and (c) only

39. The block diagram of a feedback compensated system is given below :



Which of the following statements are **correct** ?

(a) When $K_t = 0$, the feedback compensation is in-effective and the system is uncompensated

(b) When $K_t = 0$, the feedback compensation is most effective and system is compensated

(c) The performance of the compensated system depends on K_t and T

(d) The performance of the compensated system does not depend on T

Options :

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

40. The capacitor microphone is most widely used for precision measurements because it has :

(a) Good frequency response

(b) Excellent linearity

(c) Large dynamic pressure range

Which of the above are **correct** ?

(1) (a) and (b) only (2) (a) and (c) only (3) (b) and (c) only (4) (a), (b) and (c)

41. A good silicon APD has a capacitance of 5pF, with negligible dark current and is operating with a post detection bandwidth of 50 MHz. The photocurrent before gain is given by 10^{-7} Amp. The operating temperature is 18°C . The value of Load resistor to be connected with APD is given by :

(1) 536.5 ohm (2) 635.5 ohm (3) 835.5 ohm (4) 83.5 ohm

42. For optical sources, following statements are given :

(a) They should have large spectral bandwidth

(b) They should have very narrow spectral line width

(c) They should accurately track the electrical input signal

(d) The source should have linearity property

Out of the above, following are **correct** :

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

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

43. A multimode graded index fiber, exhibits total pulse broadening of 0.1 μs over a distance of 15 km. Following data is estimated by using the concept of that there is no inter-symbol interference :

(a) The maximum possible Bandwidth is 5 MHz

(b) The dispersion per unit length is 6.67 ns/km

(c) The maximum possible B.W. is 10 MHz

(d) The dispersion/unit length is 3.37 ns/km

Which is the **correct** option ?

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

44. Consider the following statements regarding z-transform :

(a) The z-transform replaces the Laplace transform for sampled-data system

(b) The z-transform replaces the Laplace transform for continuous-data system

(c) The z-transform provides direct parallels to the s-plane analysis of transients, steady state errors, stability etc.

(d) We cannot map points on s-plane to points on z-plane

Which of the above statements are **correct** ?

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

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

45. Consider the following statements regarding poles and zeros of network function.

(a) The total number of poles is equal to the total number of zeros in a rational network function

(b) The poles and zeros of a network function determine the magnitude of the response

(c) The poles of a network function determine the waveform of the time variation of the response

Which of the above statements are **correct** ?

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

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

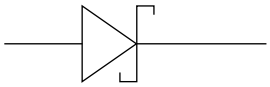
46. Match the following :

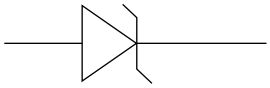
(a)	Ambipolar Diffusion Constant	(i)	$\sqrt{\frac{\mu_n D_n}{\mu_p D_p}}$
(b)	Ambipolar Diffusion Constant of the excess carriers	(ii)	$\frac{(n+p)D_n D_p}{nD_n + pD_p}$
(c)	Diffusion Constant for holes	(iii)	$\frac{2D_n D_p}{D_n + D_p}$
(d)	Constant γ	(iv)	$\frac{D_a(1+\gamma)}{2\gamma}$

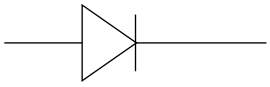
Code :

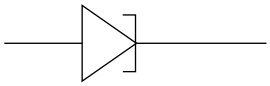
	(a)	**(b)**	**(c)**	**(d)**
(1)	(ii)	(iii)	(iv)	(i)
(2)	(i)	(ii)	(iii)	(iv)
(3)	(iii)	(iv)	(i)	(ii)
(4)	(iv)	(i)	(ii)	(iii)

47. Match the following :

(a) P-N Junction diode (i) 

(b) Zener diode (ii) 

(c) Schottky diode (iii) 

(d) Tunnel diode (iv) 

Code :

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

48. Match the following :

(a) JFET (i) $\frac{\mu_n C_{ox} w}{2L}(V_{gs} - V_{in})^2$

(b) MOSFET (ii) $\frac{2I_{DSS}}{|V_p|}\left(1 - \frac{V_{GS}}{V_p}\right)$

(c) Gunn diode (iii) $q\,(n_l \mu_l + n_u\, \mu_u)$

(d) BJT (iv) $(\beta+1)\frac{1+\frac{R_B}{R_E}}{\frac{R_B}{R_E}+(\beta+1)}$

Code :

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

49. Match the following :

	List-I		**List-II**
(a)	Surface potential at the onset of strong inversion	(i)	$-\sqrt{2\epsilon_s q N_A [V(y)+2\psi_B]}$
(b)	Charge in the inversion layer	(ii)	$V_D + 2\psi_B$
(c)	Charge in the depletion region	(iii)	$2\psi_B + \frac{\sqrt{2\epsilon_s q N_A (2\psi_B)}}{C_i}$
(d)	Threshold voltage	(iv)	$-[V_G - \psi_s(y)]C_i + \sqrt{2\epsilon_s q N_A [V(y)+2\psi_B]}$

Code :

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

50. Match the following in the context of 8257 programmable DMA controller :

	List-I **(The most significant two bits of count register)**		**List-II** **(Operations in memory mapped I/O)**
(a)	00	(i)	Illegal
(b)	01	(ii)	DMA write cycle
(c)	10	(iii)	DMA verify cycle
(d)	11	(iv)	DMA read cycle

Correct code are :

Code :

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

51. Match the following Lists :

	List - I		**List-II**
(a)	No. of Parallel Ports in 8051	(i)	2
(b)	No. of Registers in each DMA channel of 8257	(ii)	3
(c)	Type of hardware interrupts in 8085	(iii)	4
(d)	No. of priority modes in 8259	(iv)	5

Correct code are :

Code :

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

52. Match the following Lists if you execute a command-line program "test" in 'C' as below :

test string 1 string 2.

	List-I		**List-II**
(a)	argc	(i)	base address of 'test'
(b)	argv[0]	(ii)	number of arguments+1
(c)	argv[1]	(iii)	base address of string 2
(d)	argv[2]	(iv)	base address of string 1

Correct code are :

Code :

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

53. Match the following Lists in FORTRAN :

	List-I		**List-II**
(a)	RETURN	(i)	Physical end of program
(b)	STOP	(ii)	Temporarily halt the execution
(c)	PAUSE	(iii)	Value is received by the calling sub-program
(d)	END	(iv)	Terminates execution

Correct code are :

Code :

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

54. Match the following Lists :

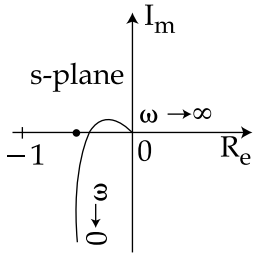
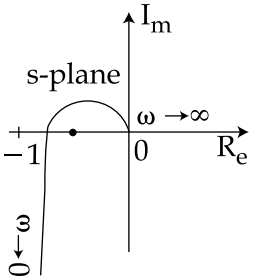
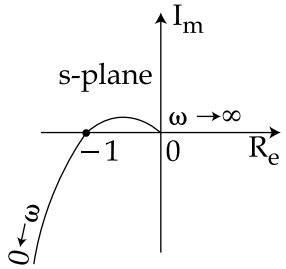
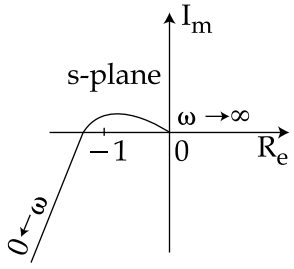
	List-I		**List-II**
(a)	LVDT	(i)	Displacement sensitive
(b)	Capacitive Type Transducer	(ii)	Motion transducers
(c)	Piezo-Electric Transducer	(iii)	Magnetic coupling
(d)	Electromechanical Type Transducer	(iv)	Crystalline material

Correct code are :

Code :

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

55. Match the following Lists :

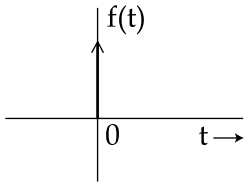
List - I		List - II
(a)		(i) Stable but oscillatory system
(b)		(ii) Stable and well damped system
(c)		(iii) Unstable system
(d)		(iv) Marginally unstable system

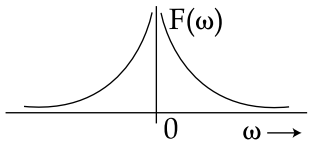
Code :

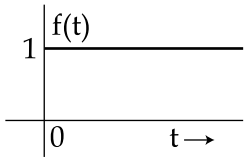
	(a)	(b)	(c)	(d)
(1)	(ii)	(i)	(iv)	(iii)
(2)	(ii)	(iii)	(i)	(iv)
(3)	(iv)	(iii)	(i)	(ii)
(4)	(iv)	(i)	(ii)	(iii)

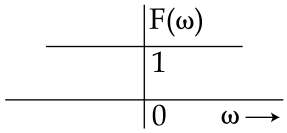
56. Match the following Lists :

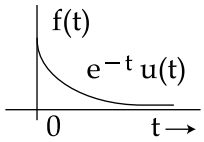
List - I **List - II**

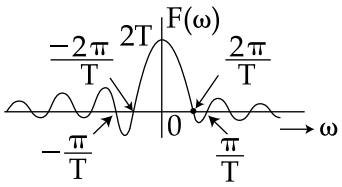
(a) 

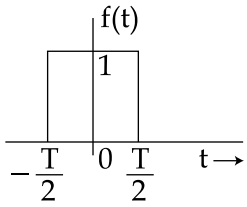
(i) 

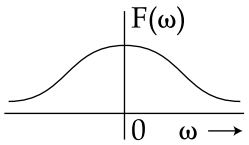
(b) 

(ii) 

(c) 

(iii) 

(d) 

(iv) 

Correct codes are :

Code :

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

57. Match the following Lists :

	List-I		**List-II**
(a)	Open circuit parameters	(i)	$\begin{bmatrix} \frac{I_1}{V_1} & \frac{I_1}{V_2} \\ \frac{I_2}{V_1} & \frac{I_2}{V_2} \end{bmatrix}$
(b)	Short circuit parameters	(ii)	$\begin{bmatrix} \frac{V_1}{I_1} & \frac{V_1}{V_2} \\ \frac{I_2}{I_1} & \frac{I_2}{V_2} \end{bmatrix}$
(c)	Hybrid parameters	(iii)	$\begin{bmatrix} \frac{V_1}{V_2} & \frac{V_1}{-I_2} \\ \frac{I_1}{V_2} & \frac{I_1}{-I_2} \end{bmatrix}$
(d)	Transmission parameters	(iv)	$\begin{bmatrix} \frac{V_1}{I_1} & \frac{V_1}{I_2} \\ \frac{V_2}{I_1} & \frac{V_2}{I_2} \end{bmatrix}$

Correct codes are :

Code :

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

58. In following lists, there are materials and their band gap energies.

Match the following Lists :

	List-I		**List-II**
	Material		**Band gap Energies (eV)**
(a)	GaAs	(i)	0.73-1.35 eV
(b)	GaAlAs	(ii)	0.96-1.24 eV
(c)	InGaAs	(iii)	1.4-1.55 eV
(d)	InGaAsP	(iv)	1.4 eV

Correct codes are :

Code :

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

59. Following are the inductances for different Geometries used in Microwaves :

Match the following Lists :

	List-I		**List-II**
	Inductor		**Inductance in(pH/mil)**
(a)	Wire inductor	(i)	$L = 31.25\ N^2D$
(b)	Circular Loop inductor	(ii)	$L = 8.5\ \sqrt{A}\ (N)^{\frac{5}{3}} \times 10^3$
(c)	Square Spiral inductor	(iii)	$L = 5.08 l \left[\ln\left(\frac{t}{w+t} \right) - 1.76 \right]$
(d)	Circular Spiral inductor	(iv)	$L = 5.08 l \left[\ln\left(\frac{l}{d} \right) + 0.386 \right]$

Correct codes are :

Code :

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

60. Match the following lists in terms of Electrical and Magnetic circuits :

List-I (Magnetic circuits)		**List-II (Electrical circuits)**	
(a)	$\frac{N.i}{\phi}$	(i)	$\sum_m V_m$
(b)	$\sum_m N_m.i_m$	(ii)	$\sum_k i_k = 0$
(c)	$\sum \phi_k = 0$	(iii)	$\frac{1}{\rho}$
(d)	μ	(iv)	$\frac{V}{i}$

Correct code are :

Code :

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

61. Match the following Lists :

	List-I		**List-II**
(a)	Directive Gain	(i)	$\frac{\text{radiated power}}{\text{total input power}}$
(b)	Directivity	(ii)	$\frac{\lambda^2}{4\pi}.D$
(c)	Power Gain	(iii)	$\frac{4\pi\psi}{P_{(\text{radiated})}}$
(d)	Effective Area	(iv)	$10 \log_{10}(g_d)_{max}$

Correct codes are :

Code :

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

62. Match the following Lists :

	List-I		**List-II**
(a)	ASK	(i)	Multiplier and an integrator
(b)	Matched filter	(ii)	Minimizes SNR at the detection instant
(c)	PSK	(iii)	Digital to digital encoding
(d)	Correlation receiver	(iv)	Maximum probability of error

Correct code are :

Code :

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

63. Match the following Lists :

	List-I		**List-II**
(a)	AM wave	(i)	$V_c \cos [\omega_c t + m\cos(\omega_m t)]$
(b)	FSK	(ii)	$A \cos [\omega_0 t + \phi(t)]$
(c)	FM wave	(iii)	$V_c \cos [2\pi(f_c + V_m(t)\Delta f)t]$
(d)	BPSK	(iv)	$[1 + m.\sin(2\pi f_m t)]\ [E_c \sin (2\pi f_c t)]$

Correct code are :

Code :

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

64. Match the following Lists :

	List-I		**List-II**
(a)	RAM	(i)	all data is wiped out of the stored contents
(b)	EPROM	(ii)	act as adjunct to slower main memory
(c)	E^2PROM	(iii)	Read-write memory
(d)	Cache	(iv)	It can be used to change certain bytes from the stored data

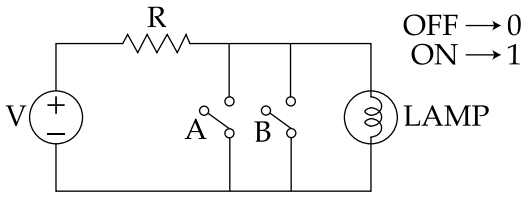
Correct code are :

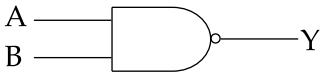
Code :

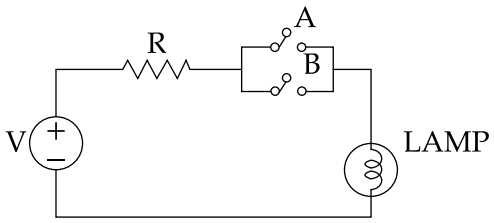
	(a)	**(b)**	**(c)**	**(d)**
(1)	(iii)	(i)	(iv)	(ii)
(2)	(ii)	(iv)	(i)	(iii)
(3)	(iii)	(iv)	(ii)	(i)
(4)	(iii)	(iv)	(i)	(ii)

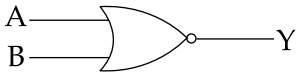
65. Match the following Lists :

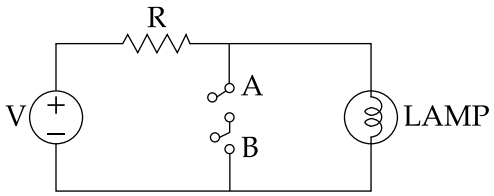
List - I **List - II**

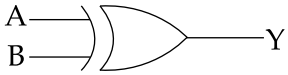
(a) 

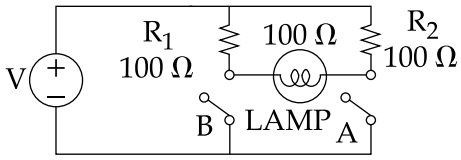
(i) 

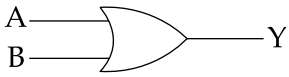
(b) 

(ii) 

(c) 

(iii) 

(d) 

(iv) 

Correct codes are :

Code :

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

66. The following semiconductor material are given

(a) C (b) Si (c) GaAs (d) InP

Arrange the above in the increasing order of their Hole Mobility at 300 K.

Options :

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

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

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

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

67. Arrange the following amplifier in the increasing order of their Current Gain.

(a) Common-emitter amplifier

(b) Common-base amplifier

(c) Darlington amplifier in common-emitter configuration

(d) Common-collector amplifier

Options :

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

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

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

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

68. Arrange the following pins of 8086 μp in the descending order :

(a) INTR (b) AD_0 (c) MN/$\overline{MX}$ (d) $\overline{LOCK}$

The **correct** sequence is :

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

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

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

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

69. What is the **correct** sequence of the following operators in 'C' from highest to lowest precedence order ?

(a) == (b) %= (c) % (d) <=

The **correct** sequence is :

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

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

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

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

70. Following are the semiconductor materials having certain values of recombination co-efficients. Arrange them in terms of ascending order :

(a) GaP (b) Si (c) InAs (d) GaAs

The **correct** sequence in ascending order of their values are :

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

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

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

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

71. Following transmission media are given :

(a) Twisted pair cables (b) Optical fiber cables

(c) Coaxial cables (d) Microwaves

For high rate data transmission systems, arrange the above in terms of their Losses in ascending orders.

The **correct** sequence is given by :

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

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

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

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

72. Consider the following circuits :

(a) Integrating circuit

(b) Active differentiation circuit

(c) Notch type electrical filter

Arrange the above circuit models in decreasing order of their complexity.

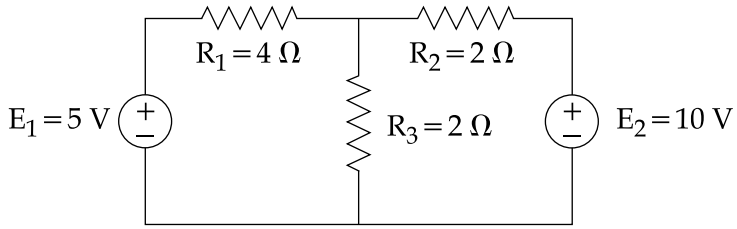
(1) (a), (b), (c)

(2) (a), (c), (b)

(3) (b), (c), (a)

(4) (c), (b), (a)

73. Consider the following network :



(a) Power dissipated in resistor R_1 is P_1
(b) Power dissipated in resistor R_2 is P_2
(c) Power dissipated in resistor R_3 is P_3

Arrange the above in increasing order of the dissipated power :

(1) (a), (c), (b)
(2) (a), (b), (c)
(3) (b), (c), (a)
(4) (c), (a), (b)

74. Consider the following systems :

(a) Satellite
(b) Conventional Public Address System
(c) Conventional Radio Receiver
(d) Laser detector

Arrange the above systems in order of their increasing order of operational frequency :

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

75. Consider the following logic families :

(a) Standard TTL logic family
(b) ECL - logic family
(c) RTL - logic family
(d) CMOS - logic family

Arrange the above logic families in order of their decreasing power dissipation :

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

Directions : Questions 76 to 95.

The following items consist of two statements, one labelled as "**Assertion(A)**" and the other labelled as "**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.

Code :

(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.

76. **Assertion (A) :** In a p-n junction the electron crossing the junction from right to left constitute a current in the same direction as hole crossing the junction from left to right.

Reason (R) : In a p-n junction the low value of depletion region capacitance can be obtained with reverse biasing.

77. **Assertion (A) :** For integrated circuit production the line width limit of optical Lithography lies near 0.4 μm, although 0.2 μm feature may eventually be printed under carefully controlled conditions.

Reason (R) : A negative resist on exposure to light becomes less soluble in a developer solution, while a positive resist becomes more soluble.

78. **Assertion (A) :** The total gain of a cascaded system is determined by the product of the gains of each stage.

Reason (R) : The gain of each stage must be determined under loaded conditions.

79. **Assertion (A) :** The tunnel diode shows the negative differential resistance between peak voltage and valley voltage.

Reason (R) : In a tunnel diode, for a voltage larger than valley voltage, the current increases exponentially.

80. **Assertion (A) :** A two byte instruction of 8085 has an operation code in first byte and operand/address in the second byte.

Reason (R) : Source and destination addresses are made implicit in order to reduce the length of an instruction.

81. **Assertion (A) :** In 8086 μp, ALE is provided by the processor to latch the address into the 8282/8283 address latch.

Reason (R) : Whenever the processor sends a valid address on the multiplexed AD_0-AD_{15} lines, it also makes the ALE high.

82. **Assertion (A) :** In 'C', bit fields cannot be used in a union.

Reason (R) : If one element of union is initialized then it also initializes other elements of the union.

83. **Assertion (A) :** Encapsulation is implemented by a 'class' in C++.

Reason (R) : Private, public and protected access specifiers are used.

84. **Assertion (A) :** The magnetic flux per unit length through a loop of small length is called the magnetic flux density.

Reason (R) : The direction of magnetic flux density is taken as the normal to the plane of the loop when oriented to enclose maximum flux.

85. **Assertion (A) :** For transmission lines, having their length equal to odd multiples of $\left(\frac{\lambda}{4}\right)$, the following expressions are given

$\sin \beta L = \pm 1$ and $\cos \beta L = 0$.

Reason (R) : Under the above conditions, i.e. for odd multiples of Quarter wavelengths the input impedance becomes equal to $Z = \frac{Z_0 . \cosh(\alpha L)}{\sinh(\alpha L)}$.

86. **Assertion (A) :** The z-parameters are open circuit parameters.

Reason (R) : The z-parameters may be measured at one terminal while the other terminal is open.

87. **Assertion (A) :** All the mesh currents are necessarily the loop currents but all the loop currents may not be the mesh current.

Reason (R) : The mesh current is the current which flows only around the perimeter of a mesh.

88. **Assertion (A) :** Vestigial side band gives rise to frequencies very close to the carrier frequency.

Reason (R) : It is not possible to go to extreme and suppress one complete side band by physically realizable filters.

89. **Assertion (A) :** Lesser number of bits per code are required due to less number of quantization levels in DPCM.

Reason (R) : In this case, the difference between two successive samples is quantized which do not differ much in amplitude.

90. **Assertion (A) :** The hexadecimal numbers are first converted into binary numbers and operations are performed using binary representation of hexadecimal numbers using rules of binary numbers.

Reason (R) : The information can be handled in hexadecimal form in digital circuits but it is easier to enter information using binary numbers.

91. **Assertion (A) :** Emitter - Coupled Logic (ECL) is the fastest of all logic families and used in applications where very high speed is essential.

Reason (R) : High speed in ECL is because the transistors are used in difference amplifier configuration in which they are never driven into saturation and the storage time is eliminated.

92. **Assertion (A) :** The synchronous speed of an induction motor can be varied by varying the frequency of the applied voltage.

Reason (R) : With smaller frequency of operation, there is a large value of slip and motor rotates non-linearly with the frequency 'f' of the applied voltage.

93. **Assertion (A) :** The diameter of SMF is selected in such a way that single fundamental ray travels straight along the axis of the core of the fiber.

Reason (R) : The diameter of core of SMF is more than 10 μm and outer diameter is less than 125 μm.

94. **Assertion (A) :** The stability analysis of systems with dead time can be conducted easily using the Bode plots.

Reason (R) : The magnitude plot of a system is unaffected by the presence of dead time.

95. **Assertion (A) :** A Non-Return to Zero (NRZ) type digital recording system is more common and efficient.

Reason (R) : It is possible to record twice the number of digits for the same number of pulses.

Based on the following para, answer Q.No. 96 to 100.

Sensitivity considerations often are important in the design of Control Systems. Because all physical elements have properties that change with environment and age, we cannot always consider the parameters of the Control System to be completely stationary over the entire operating life of the system. For instance, the winding resistance of an electric motor changes as the temperature of the motor rises during operation. Control systems with electric components may not operate normally when first turned on because of the still-changing system parameters during warmup. This phenomenon is sometimes called "morning sickness". Most duplicating machines have a warmup period during which time operation is blocked out when first turn on.

96. Which of the following statements is **correct** ?

(1) A feedback can only increase the sensitivity of a system

(2) A feedback can increase or decrease the sensitivity of a system

(3) A feedback can only decrease the sensitivity of a system

(4) A feedback never affects the sensitivity of a system

97. A good Control System should be :

(a) Very sensitive to parameter variations

(b) Insensitive to parameter variations

(c) Insensitive to input commands

(d) Sensitive to input commands

Which of the above are **correct** ?

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

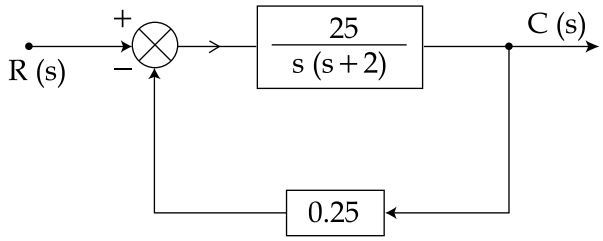
(3) (b) and (d) (4) (a) and (d)

98. The open-loop transfer function of a Unity Feedback Control System is given by $G(s) = \frac{25}{s(s+5)}$.

The steady state error will be :

(1) 0.1 rad (2) 0.2 rad (3) 0.3 rad (4) 0.5 rad

99. The sensitivity of the overall (closed-loop) transfer function for the system shown below, with respect to forward path transfer function at $\omega = 1$ rad/sec will be :



(1) 0.938 (2) 0.583 (3) 0.25 (4) 0.398

100. For an open-loop control system, sensitivity of overall transfer function M(s) with respect to forward path transfer function G(s) will be :

(1) 1 (2) 0 (3) -1 (4) ∞

- o O o -

Space For Rough Work