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A

PHD-EE-2023-24

SET-X

Electrical & Communication Engineering

Sr. No. **10001**

Time : 1¼ Hours   Max. Marks : **100**   Total Questions : **100**

Roll No. (in figures)_____ (in words) _____

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(Signature of the Candidate)   (Signature of the Invigilator)

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1. In the fabrication of monolithic ICs, Boron chloride is added as an impurity in the diffusion process. Find the diffusion time, if the furnance is heated upto 1200°C.

   (1) 01 hour   (2) 02 hours   (3) 35 minutes   (4) 20 minutes

2. How the aluminium film coating is carried out in metalization process ?

   (1) Heating and Pouring aluminium in required place

   (2) Placing the aluminium in required place and then heating it using tungsten

   (3) Aluminium is vaccum evaporated and then condensed

   (4) None of the mentioned

3. The burried layer reduces collector series resistance by providing :

   (1) A low resistivity current path from n-type layer to n^+ contact layer

   (2) A low resistivity current path from p-type layer to n^+ contact layer

   (3) A high resistivity current path from n-type layer to n^+ contact layer

   (4) A high resistivity current path from p-type layer to n^+ contact layer

4. The carrier density in the channel in the constant voltage model is scaled as :

   (1) $1/\beta$ (2) 1

   (3) β (4) All of the mentioned

5. The parameter which is *not* scaled to any factor is :

   (1) Power speed product   (2) Switching energy

   (3) Channel resistance   (4) All of the mentioned

6. A digital CMOS IC operating at 15 MHz clock frequency consumes 130 mW, the same IC operating at 10 MHz clock frequency consumes 100 mW power. The static power consumption of the IC is :

   (1) 20 mW   (2) 40 mW   (3) 50 mW   (4) 90 mW

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7. What should be the width of metal 1 and metal 2 layers ?

   (1) $3\lambda, 3\lambda$ (2) $2\lambda, 3\lambda$ (3) $2\lambda, 4\lambda$ (4) $3\lambda, 4\lambda$

8. .... are used in thick and thin film ICs, as individual components from outside.

   (1) Transistors   (2) Active elements

   (3) Diode   (4) All of the mentioned

9. Growth of SiO_2 on Si substrate can be achieved in two ways either using oxygen or using water vapour for growing thicker oxides ?

   (1) dry oxidation can be used   (2) wet oxidations can be used

   (3) any of dry & wet can be used   (4) dry oxidation followed by wet oxidation

10. If P is development, Q is etching, R is alignment & exposure and S is photoresist stripping then the order in which they are carried out in a standard photolithography process is :

    (1) P-Q-R-S   (2) Q-P-S-R   (3) P-S-R-Q   (4) R-P-Q-S

11. Which of the following options about tunnel diodes is **incorrect** ?

    (1) The width of depletion region is high as compared to the p-n junction.

    (2) Impurity concentration is high as compared to p-n junction.

    (3) The V-I characteristics show the negative resistance region.

    (4) Carrier velocities are very high.

12. The following structures are used in High Electron Mobility Transistor :

    (1) Diffusion & self aligned ion implanted structure

    (2) Recess gate structure

    (3) Self aligned ion implented structure & recess gate structure

    (4) Diffusion & recess gate structure

13. Preliminary filtration is one of the steps used in the liquid phase purification method of CNT. What is its purpose ?

(1) To remove bulk solid particles

(2) To remove bulk graphite particles

(3) To remove fullerences and catalysts

(4) To isolate MWCNT

14. By nano scale distribution of the .... in matrix improves the life and performance.

(1) Carbide

(2) Hydrides

(3) Tungesten

(4) Nitrides

15. Solar cell is made from bulk materials that is cut into water of .... thickness.

(1) 120-180 μm

(2) 120-220 μm

(3) 180-220 μm

(4) 180-240 μm

16. An LCD requires a power of .... to light up are segment of a seven segment display system.

(1) 20 μm

(2) 10 mW

(3) 10 nW

(4) 02 μW

17. An abrupt silicon pn-junction has dopant concentration of $Na = 2 \times 10^{16}$ cm^{-3} and $Nd = 2 \times 10^{15}$ cm^{-3} at $T = 300$ K. A reverse voltage of $V_R = 8$ V is applied to the pn-junction. What will be the maximum electric field in the depletion region ?

(1) 3.23×10^5 V/cm

(2) 3.5×10^4 V/cm

(3) 7.0×10^4 V/cm

(4) 6.45×10^5 V/cm

18. The impurity level in an extrinsic semiconductor about .... of pure semiconductor.

(1) 10 atoms for 108 atoms

(2) 1 atom for 108 atoms

(3) 1 atom for 104 atoms

(4) 1 atom for 100 atoms

19. When the temperature of an extrinsic semiconductor is increased, the pronounced effect is on ....

(1) Minority carriers

(2) Majority carriers

(3) Minority & Majority carriers

(4) Junction capacitance

20. Mobility of holes is .... mobility of electrons in intrinsic semiconductors.

(1) Equal

(2) Greater than

(3) Less than

(4) Cannot define

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21. Fermi level for intrinsic semiconductor lies :

   (1) At middle of the band gap   (2) Close to conduction band

   (3) Close to valence band   (4) None

22. Consider the transistor shown in Fig. 1 :
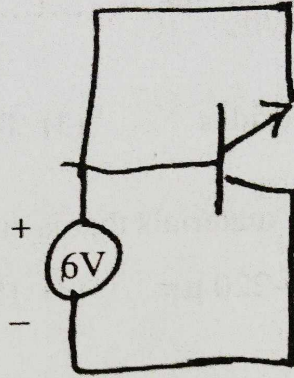

Fig. 1

The transistor is operating in :

   (1) Forward-Active region   (2) Reverse-Active region

   (3) Saturation region   (4) Cut off region

23. The electron concentration in silicon decreases linearly from 10^{16} cm^{-3} to 10^{15} cm^{-3} over a distance of 0.10 cm. The cross-sectional area of sample is 0.05 cm^2. The electron diffusion coefficient, D_n is given by 25 cm^2/sec. The diffusion current in silicon will be :

   (1) 0.36 mA   (2) 3.6 mA   (3) 0.18 mA   (4) 18 mA

24. A silicon p$^+$n junction has doping concentration of $N_a = 10^{18}$ cm^{-3} and $N_d = 5 \times 10^{15}$ cm^{-3}. The cross-sectional area of the junction is $A = 5 \times 10^{-5}$ cm^2, what will be the capacitance for the applied reverse voltage, $V_R = 3$ V ?

   (1) 0.521 pF   (2) 0.005 nF   (3) 1.04 nF   (4) 2.61 nF

25. Consider on MOS structure with p-type silicon and $N_a = 6 \times 10^{15}$ cm^{-3}. If the gate is aluminium then the metal semiconductor work function difference, ϕ_{ms} of the MOS structure will be :

   (1) −2.256 V   (2) −0.944 V   (3) 7.344 V   (4) 4.144 V

26. The phenomenon known as "Early Effect" in a bipolar transistor refers to a reduction of base-width caused by :

    (1) Electron-hole recombination base

    (2) The forward biasing of emitter-base junction

    (3) The early removal of stored base charge during saturation to cut-off region

    (4) The reverse biasing of base-collector junction

27. The common short circuit current gain β of a transistor :

    (1) is a monotonically increasing function of collector current I_C

    (2) is a monotonically decreasing function I_C

    (3) increasing with I_C, for low I_C reaches a maximum and then decrease with further increase in I_C

    (4) is not a function of I_C

28. The built-in-potential (diffusion potential) in a pn-junction :

    (i) increases with increase in temperature

    (ii) increases with increase in doping in the dioping levels of two sides

    (iii) is equal to the average of the Fermi levels of two sides

    (iv) is equal to the difference of the Fermi levels of two sides

    Which of the following statement is *correct* ?

    (1) (i), (ii) & (iv)   (2) (i) & (ii)   (3) (ii) & (iii)   (4) (i) & (iv)

29. The current gain of the transistor as shown in Fig. 2 is $\beta = 125$. The Q-point values $(I_{CQ}$ & $V_{CEQ})$ are :
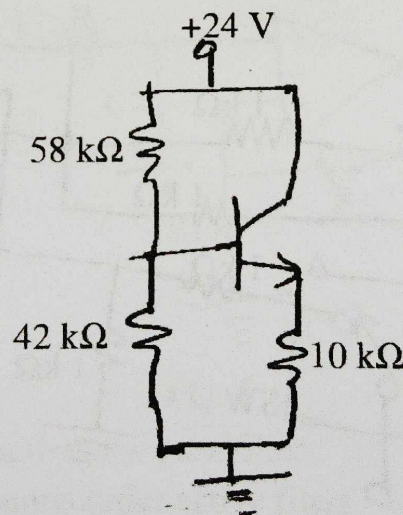

Fig. 2

    (1) 0.418 mA & 20.4 V   (2) 0.913 mA & 16.23 V

    (3) 0.913 mA & 14.8 V   (4) 0.418 mA & 18.43 mV

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30. The collector to emitter cut-off current (I_{CEO}) to base cut-off current (I_{CBO}) is

.... as α is the CB current gain of transistor :

(1) $I_{CEO} = I_{CBO}$
(2) $I_{CEO} = \alpha\, I_{CBO}$

(3) $I_{CEO} = \dfrac{I_{CBO}}{1+\alpha}$
(4) $I_{CEO} = \dfrac{I_{CBO}}{1-\alpha}$

31. In a MOSFET the threshold voltage can be lowered by :
(1) increasing the gate oxide thickness
(2) reducing the substrate concentration
(3) increasing the substrate concentration
(4) using the dielectric of lower constant

32. The disadvantage of capacitor input LC filter in rectifier is :
(1) high cost, more weight and external field produced by series inductor
(2) high cost, moderate weight and no external field produced by series inductor
(3) high cost, less weight
(4) low cost, more weight

33. Which of the following architecture can be designed as an instrumentation amplifier ?
(1) Indirect current feedback
(2) Direct current feedback
(3) Indirect voltage feedback
(4) Direct voltage feedback

34. The circuit as shown in Fig. 3, $V_O = V_{OA}$ for switch SW in position A and $V_O = V_{OB}$

for switch SW in position B. Assume that op amp is ideal. The value of $\dfrac{V_{OB}}{V_{OA}}$ is :

Fig. 3

(1) 3
(2) 0.5
(3) 2
(4) 1.5

35. In the differential amplifier as shown in Fig. 4, the magnitude of the common-mode and diferential-mode gains are A_{cm} and A_d, respectively. If the resistance R_E is increased, then :

Fig. 4

(1) A_{cm} increases

(2) A_d increases

(3) Common-mode rejection ratio increases

(4) Common-mode rejection ratio decreases

36. Consider the following statements regarding the circuit as shown in Fig. 5
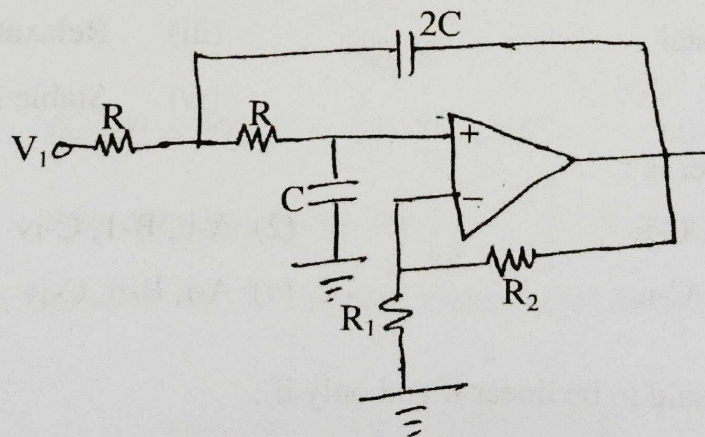
Fig. 5

(i) The circuit represents an active low pass filter.

(ii) The circuit represents a second order active filter.

(iii) The circuit has a cut-off rate of 40 dB has decade.

(1) (i), (ii) & (iii) are correct

(2) (i) & (ii) are correct

(3) Only (i) is correct

(4) (ii) & (iii) are correct

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37. An op-amp has open loop gain of 10^5 and an open loop cut-off frequency of 10 Hz. If this op-amp is connected as an amplifier with a closed gain of 100, then the new upper cut-off frequency is :

(1) 100 kHz   (2) 1000 kHz   (3) 10 Hz   (4) 10 kHz

38. .... converts Direct Current (DC) signals from the power supply units to Alternate Current (AC) signals.

(1) micro controllers   (2) oscillators

(3) transformers   (4) relays

39. Which one of the following is an audio frequency oscillator ?

(1) Wein bridge   (2) Hartlay   (3) Colpitts   (4) Crystal

40. Match the following :

Group-I		Group-II	
(A)	Hartlay	(i)	Low frequency oscillator
(B)	Wein-Bridge	(ii)	High frequency oscillator
(C)	Crystal	(iii)	Relaxation oscillator
		(iv)	Stable frequency oscillator

Correct answer is :

(1) A-i, B-iii, C-ii   (2) A-ii, B-1, C-iv

(3) A-iv, B-i, C-ii   (4) A-i, B-ii, C-iv

41. A network is said to be linear if and only if :

(1) the response is proportional to the excitation function

(2) the principle of superposition applies

(3) the principle of homogeneity applies

(4) both (2) and (3)

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42. A battery charger can drive a current of 5 A into 1 Ω resistance connected at its output terminals. If it is able to charge an ideal 2 V battery at 7 A rate, then its Thevenin's equivalent will be :

    (1) 7.5 V in series with 0.5 Ω

    (2) 12.5 V in series with 1.5 Ω

    (3) 7.5 V in parallel with 0.5 Ω

    (4) 1.25 V in parallel with 1.5 Ω

43. In a given circuit as shown in Fig. 6, if the power dissipated in 6 Ω resistor is zero, the V is :

Fig. 6

    (1) $20\sqrt{2}\ \angle 45°$ (2) $20\ \angle 30°$ (3) $20\ \angle 45°$ (4) $20\sqrt{2}\ \angle 30°$

44. Y parameters of a four terminal block are $\begin{bmatrix} 4 & 2 \\ 1 & 1 \end{bmatrix}$. A single element of 1 Ω is connected acoss as shown in Fig. 7. The new Y-parametes will be :
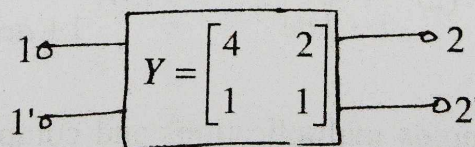
Fig. 7

    (1) $\begin{bmatrix} 4 & 3 \\ 2 & 2 \end{bmatrix}$ (2) $\begin{bmatrix} 4 & 2 \\ 1 & 1 \end{bmatrix}$ (3) $\begin{bmatrix} 5 & 1 \\ 0 & 2 \end{bmatrix}$ (4) $\begin{bmatrix} 3 & 2 \\ 1 & 2 \end{bmatrix}$

45. In the given circuit as shown in Fig. 8, the switch was closed for a long time before opening at t = 0. The voltage v_x at t = 0^+ is :
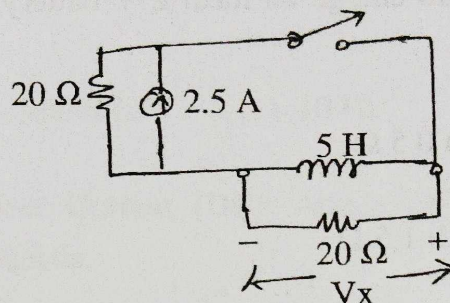
Fig. 8

(1) 25 V   (2) 50 V   (3) –50 V   (4) 0 V

46. What is the steady state current in 2 Ω resistor as shown Fig. 9 ? Internal resistance of the battery is negligible and value of the capacitance C is 0.2 μF :
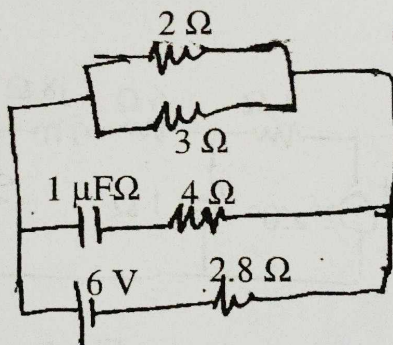
Fig. 9

(1) 1.5 A   (2) 1.2 A   (3) 0.6 A   (4) 0.9 A

47. Fourier Transform of $-a^n u(-n-1)$ is :

(1) $\dfrac{1}{1+ja\omega}$ (2) $\dfrac{1}{1-ja\omega}$ (3) $\dfrac{1}{1+ae^{-j\omega}}$ (4) $\dfrac{1}{1-ae^{j\omega}}$

48. The number of complex multiplications and complex additions involved in the direct computation of δ-point DFT :

(1) 64 & 56   (2) 8 & 16   (3) 64 & 64   (4) 64 & 8

49. Non-linearity in the relationship between Ω and ω is known as :

    (1) aliasing

           (2) frequency warping

    (3) unwarping

           (4) frequency mixing

50. For rectangular window, the peak side lobe magnitude in dB is :

    (1) −58 dB   (2) −41 dB   (3) −31 dB   (4) − 13 dB

51. The abrupt truncation of Fourier series results in oscillations in :

    (1) both pass band & stop band   (2) only pass band

    (3) only stop band   (4) none of these

52. The trigonometric Fourier series representation of a function with half wave symmetry consists of :

    (1) even hormonics   (2) old hormonics

    (3) sine terms only   (4) cosine terms only

53. The circuit as shown in Fig. 10 converts a binary code $Y_1 \ Y_2 \ Y_3$ into :
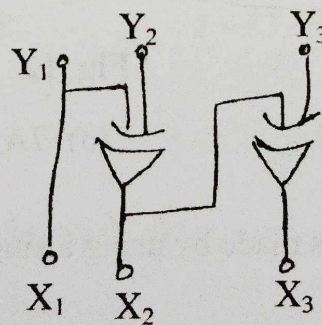
Fig. 10

    (1) Hamming code   (2) BCD code

    (3) Gray code   (4) Excess 3-code

54. The circuit in Fig. 11 produces the output sequence :
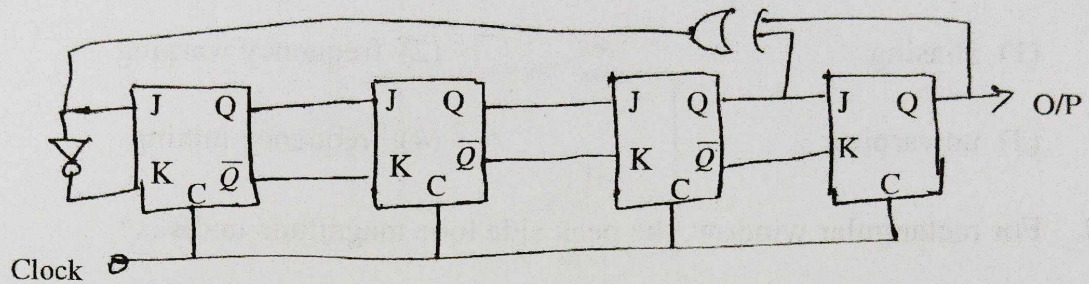
Fig. 11

(1) 1111   1111   0000   0000

(2) 1111   0000   1111   0000

(3) 1111   0001   0011   0100

(4) 1010   1010   1010   1010

55. If initially register contains byte B7H, then after 04 clock pulses, the contents of register will be shown in Fig. 12 :
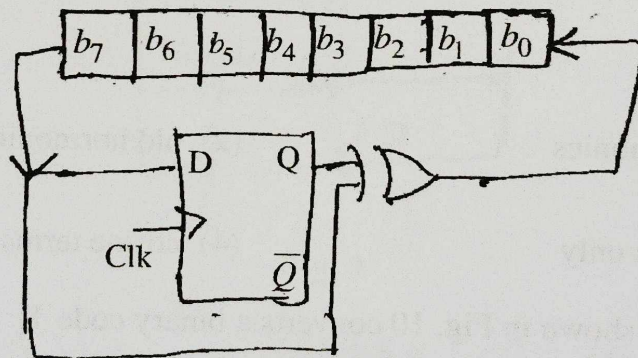

Fig. 12

(1) 7C   (2) 7E   (3) 7A   (4) 74

56. A switch-tail ring counter is made by using a single D-FF. The resulting circuit is :

(1) SR Flip-flop   (2) JK Flip-flop

(3) D-FF   (4) T-FF

57. A pulse train can be delayed by a finite number periods usings of clock :

(1) a seriel-in-serial shift register

(2) a serial-in-parallel-out shift register

(3) a parallel-in-serial-out shift register

(4) a serial-in-parallel-out shift register

58. Dual slope integration type analog to digital converters provide :

(1) higher speeds compared to all other types of A/D conveters

(2) poor rejection of power supply hum

(3) better resolution compared to all other types of A/D converters for the same number of bits

(4) very good accuracy without putting extreme requirements on component stability

59. In a 4-bit weighted resistor D/A converter, the resister value corresponding to MSB will be :

(1) $4\ k\Omega$ (2) $8\ k\Omega$ (3) $16\ k\Omega$ (4) $32\ k\Omega$

60. An 8-bit digital ramp ADC with a 40 mV resolution uses a clock frequency of 2.5 MHz and a comparator with $V_T = 1$ mV. The digital output for $V_A = 6.000$ V is :

(1) 1011111   (2) 1011110   (3) 10010111   (4) 10010110

61. When the memory or I/O device is not able to respond quickly, wait states (Tw) are inserted between .... by .... the READY input of the 8086.

(1) T_3 & T_4 disabling   (2) T_2 & T_3 disabling

(3) T_1 & T_2 enabling   (4) T_3 & T_4 enabling

62. AL, AX and DX registers of 8086 are used in following instructions :

(1) Multiply, Divide, I/O and Translate

(2) Multiply, Divide, I/O and Decimal adjustments

(3) Multiply, Divide, I/O, Translate and Decimal adjustments

(4) Multiply, Divide and I/O

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63. If [BX] = 1234 H, [BP] = 2490 H, AX = 1000 H, LIST = 5980 H, CS = 3000 H, DS = 2000 H, ES = 5000 H and SS = 6000 H. The effective and physical address of MOV LIST [BP], AX is given by :

    (1) 8E10, 28E10   (2) 8E10, 68E10   (3) 7E10, 27E10   (4) 7E10, 67E10

64. If CF = 1, AX = 1F89H, what are the contents of AX and CF after the execution of following instructions ?

    MOV CL, 2

    RCL AX, CL

    (1) AX = 2A6BH & CF = 1   (2) AX = 7EA6H & CF = 0

    (3) AX = 7FB7H & CF = 0   (4) AX = 0F89H & CF = 1

65. Why is CHMOS technology preferred over HMOS technology for designing devices of MCS-51 family ?

    (1) Due to higher noise immunity

    (2) Due to lower power consumption

    (3) Due to higher speed

    (4) All of the above

66. Which is the only register without internal on-chip RAM address in MCS-51 ?

    (1) Stack pointer   (2) Program counter

    (3) Data printer   (4) Timer register

67. Which among the below mentioned functions does *not* belong to the category of alternate functions performed by Port-3 (Pins 10-17) ?

    (1) Read/write control signals   (2) Serial ports

   (3) Internal interrupts   (4) External interrupts

68. How many single byte, two byte and three byte instructions are supported by MCS-51 for overall instruction sent ?

(1) 45 single byte, 45 two bytes and 17 three bytes

(2) 45 single byte, 45 two bytes and 15 three bytes

(3) 55 single byte, 40 two bytes and 20 three bytes

(4) 40 single byte, 55 two bytes and 17 three bytes

69. Which rotate instructions has an ability to modify CY flag by moving the bit-7 & bit-0 respectively to accumulator ?

(1) RR & RL   (2) RRC & RLC   (3) RR & RLC   (4) RL & RLC

70. Which instructions affect the program counter ?

(1) CALL & RETURN

(2) RETURN & JUMP

(3) PUSH & POP

(4) CALL & JUMP

71. Which one of the following sets of equations is independent of Maxwell's equations ?

(1) Two curl equations

(2) Two divergence equations

(3) Both curl and divergence equations

(4) Two curl equations combined with continuity equation

72. The lowest frequency at which a uniform plane wave incident from region 1 onto the boundary at $z = 0$ will have no reflection is :

(1) 45°   (2) 30°   (3) 90°   (4) 60°

73. A receiving antenna is located 100 m away from the transmitting antenna. If the effective area of the receiving antenna is 500 cm^2 and the power density at the receiving location is 2 mW/m^2, the total power received is :

(1) 10 μW   (2) 100 nW   (3) 100 μW   (4) 10 nW

74. Which of these is *not* true of a lossless line ?

(1) $Z_{in} = -j\,Z_0$ for a shorted line with $l = \lambda/8$

(2) $Z_{in} = Z_0$ for a mached line

(3) $Z_{in} = j\,\infty$ for a shorted line with $l = \lambda/4$

(4) All of the above

75. Which of the following potentials does *not* satisfy Laplace's equation ?

(1) $V = 2x + 5$

(2) $V = \rho\cos\phi + 10$

(3) $V = r\cos\phi$

(4) $V = \dfrac{10}{-}$

76. By saying that the electrostatic field is conservative, we do *not* mean that :

(1) It is the gradient of a scalar potential

(2) Its circulation is identically zero

(3) Its curl is identically zero

(4) The potential difference between any point is zero

77. A zero mean white Gaussian noise is passed through an ideal low pass filter of bandwidth 10 kHz. The output of the samples so obtained would be :

(1) Correlated

(2) Statistically independent

(3) Incorrelated

(4) Orthogonal

78. If in a broadcasting studio, a 1000 kHz carrier is modulated by an audio signal of frequency range 100-5000 kHz, the width of channel is :

(1) 5 kHz

(2) 4.9 kHz

(3) 995 kHz

(4) 10 kHz

79. The bit rate of the digital communication system is MKBPS. The modulation used is 16 QAM. The minimum bandwidth required for ideal transmission is :

    (1) M/2 kHz

    (2) M/16 kHz

    (3) MHz

    (4) M/8 kHz

80. The noise performance of a square low demodulator of AM signal is :

    (1) better than that of an envelope detector

    (2) better than that of a synchronous detector

    (3) identical than that of a synchronous detector

    (4) poorer than that of envelope detector

81. If carrier modulated by a digital bit stream has one of the possible phases of 0°, 90°, 180° and 270°, then the modulation is called :

    (1) BPSK

    (2) QPSK

    (3) QAM

    (4) MSK

82. A signal having uniformly distributed amplitude in the interval (−V, +V) is to be encoded using PCM with uniform quantization. The signal to quantization noise is determined by the :

    (1) number of quantizing levels

    (2) sampling rate

    (3) dynamic range to the signal

    (4) power spectrum of signal

83. In asynchronous TDM, for n signal sources, each frame contains m slots, where m is usually :

    (1) $2n$

    (2) greater than $2n$

    (3) n

    (4) less than n

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84. An optical fiber behaves as a birefringence medium due to differences in :

    (1) Effective R-I and core geometry

    (2) Core-cladding symmetry

    (3) Transmission/propagation time of waves

    (4) Refractive indices of glass & silica

85. A single node fiber has mode field diameter 10.2 µm and V = 2.20. What is the core diameter of this fiber ?

    (1) 11.1 µm   (2) 13.2 µm   (3) 7.6 µm   (4) 10.1 µm

86. A multimode step index fiber has source of RMS spectral width of 60 nm and dispersion parameter for fiber is 150 psn m^{-1}km^{-1}. Estimate rms pulse broadening due to material dispersion :

    (1) 12.5 ns km^{-1} (2) 9.6 ns km^{-1} (3) 9.0 ns km^{-1} (4) 10.2 ns km^{-1}

87. A compared to planar LED structure, Dome LEDs have .... external power efficiency .... effective emission area and .... radiance.

    (1) greater, lesser, reduced   (2) higher, greater, reduced

    (3) higher, lesser, increased   (4) greater, greater, increased

88. The wavelength of RAPD with 70% efficiency and responsibility 0.689 A/W is given by :

    (1) 06 µm   (2) 7.21 µm   (3) 0.112 µm   (4) 03 µm

89. An RC Snubber circuit is used to protect a thysistor against :

    (1) false triggering   (2) failure to turn on

    (3) switching transiants   (4) failure to commutate

90. What is the backup duration for 600 VA UPS ?

    (1) 30 to 45 minutes   (2) 15 to 20 minutes

    (3) 01 to 05 minutes   (4) 05 to 10 minutes

91. Which of the following is **not** a characteristic of an ideal transducer ?

 (1) low noise

 (2) high repeatability

 (3) high dynamic range

 (4) low linearity

92. The .... characteristics of transducer refer to the performance of the transducer when it is subject to time varying signal.

 (1) Dynamic

 (2) Static

 (3) Transiant

 (4) Both (1) and (2)

93. High Q coils inductance can be precisely measured by :

 (1) Maxwells inductance bridge

 (2) Hay's bridge

 (3) Schering bridge

 (4) Anderson's bridge

94. The device which is used for making temporary measurements of flow is :

 (1) Venturi

 (2) Dull flow tube

 (3) Orfice plate

 (4) Pitot static tube

95. The response c(t) of a system is described by the differential equation $\dfrac{d^2}{dt^2}c(t) + 4\dfrac{d}{dt}c(t) + 5c(t) = 0$. The system response is :

 (1) Undamped

 (2) Under damped

 (3) Critically damped

 (4) Oscillatory

96. Consider the following amplifier with −ive feedback :
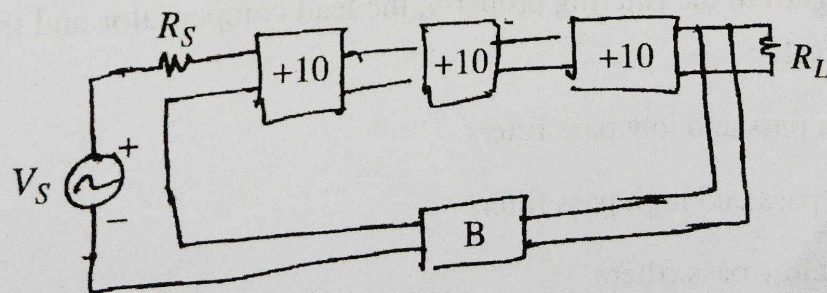
If the closed loop gain of the above amplifier is +100, the value of **B** will be :

 (1) -11×10^3

 (2) $+11 \times 10^3$

 (3) -9×10^3

 (4) $+9 \times 10^3$

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97. A system has open loop transfer function $G(s) = \dfrac{10}{s(s+1)(s+3)}$, what is the steady state error when it is subjected to the input $r(t) = 10 + 2t + 3/2\,t^2$?

(1) 0.4   (2) 4   (3) infinity   (4) none of these

98. The given characteristics polynomial $s^4 + s^3 + 2s^2 + 2s + 3 = 0$ has :

(1) zero root in RHS in s-plane   (2) one root in RHS of s-plane

(3) two roots in RHS of s-plane   (4) three roots in RHS of s-plane

99. Consider the following statements :

In root-locus plot, the breakaway points

(a) need not always be on real axis alone

(b) must lie on root loci

(c) must lie on 0 and 1

Which of these statements are *correct* ?

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

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

100. With regard to the filtering property, the lead compensator and the lag compensator are respectively :

(1) high pass and low pass filters

(2) low pass and high pass filters

(3) both low pass filters

(4) both high pass filters

Total No. of Printed Pages : 21

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B

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Electrical & Communication Engineering

10002

Sr. No. ....

Time : 1¼ **Hours**   Max. Marks : **100**   Total Questions : **100**

Roll No. (in figures) _____ (in words) _____

Name _____ Date of Birth_____

Father's Name _____ Mother's Name _____

Date of Examination _____

_____   _____
(Signature of the Candidate)   (Signature of the Invigilator)

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1. *All questions are compulsory.*

2. The candidates **must return** the question booklet as well as OMR Answer-Sheet to the Invigilator concerned before leaving the Examination Hall, failing which a case of use of unfair-means / mis-behaviour will be registered against him / her, in addition to lodging of an FIR with the police. Further the answer-sheet of such a candidate will not be evaluated.

3. Keeping in view the transparency of the examination system, carbonless OMR Sheet is provided to the candidate so that a copy of OMR Sheet may be kept by the candidate.

4. Question Booklet along with answer key of all the A, B, C & D code shall be got uploaded on the University Website immediately after the conduct of Entrance Examination. Candidates may raise valid objection/complaint if any, with regard to discrepancy in the question booklet/answer key within 24 hours of uploading the same on the University Website. The complaint be sent by the students to the Controller of Examinations by hand or through email. Thereafter, no complaint in any case, will be considered.

5. The candidate **must not** do any rough work or writing in the OMR Answer-Sheet. Rough work, if any, may be done in the question booklet itself. Answers **must not** be ticked in the question booklet.

6. *There will be no negative marking. Each correct answer will be awarded one full mark. Cutting, erasing, overwriting and more than one answer in OMR Answer-Sheet will be treated as incorrect answer.*

7. Use only **Black** or **Blue Ball Point Pen** of good quality in the OMR Answer-Sheet.

8. Before answering the questions, the candidates should ensure that they have been supplied correct and complete booklet. Complaints, if any, regarding misprinting etc. will not be entertained 30 minutes after starting of the examination.

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B

1. A network is said to be linear if and only if :

   (1) the response is proportional to the excitation function

   (2) the principle of superposition applies

   (3) the principle of homogeneity applies

   (4) both (2) and (3)

2. A battery charger can drive a current of 5 A into 1 Ω resistance connected at its output terminals. If it is able to charge an ideal 2 V battery at 7 A rate, then its Thevenin's equivalent will be :

   (1) 7.5 V in series with 0.5 Ω   (2) 12.5 V in series with 1.5 Ω

   (3) 7.5 V in parallel with 0.5 Ω   (4) 1.25 V in parallel with 1.5 Ω

3. In a given circuit as shown in Fig. 6, if the power dissipated in 6 Ω resistor is zero, the V is :
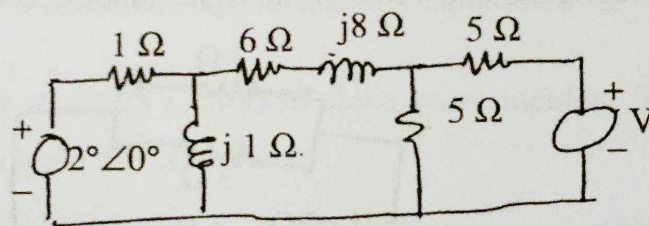
Fig. 6

   (1) $20\sqrt{2} \angle 45°$ (2) $20 \angle 30°$ (3) $20 \angle 45°$ (4) $20\sqrt{2} \angle 30°$

4. Y parameters of a four terminal block are $\begin{bmatrix} 4 & 2 \\ 1 & 1 \end{bmatrix}$. A single element of 1 Ω is connected acoss as shown in Fig. 7. The new Y-parametes will be :
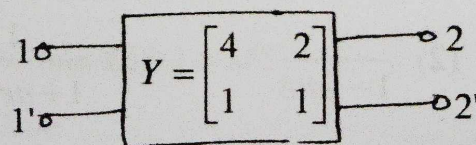
Fig. 7

   (1) $\begin{bmatrix} 4 & 3 \\ 2 & 2 \end{bmatrix}$ (2) $\begin{bmatrix} 4 & 2 \\ 1 & 1 \end{bmatrix}$ (3) $\begin{bmatrix} 5 & 1 \\ 0 & 2 \end{bmatrix}$ (4) $\begin{bmatrix} 3 & 2 \\ 1 & 2 \end{bmatrix}$

5. In the given circuit as shown in Fig. 8, the switch was closed for a long time before opening at t = 0. The voltage v_x at t = 0^+ is :
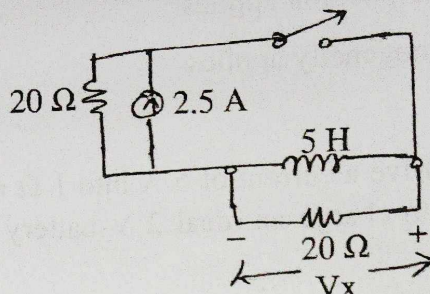

Fig. 8

(1) 25 V   (2) 50 V   (3) −50 V   (4) 0 V

6. What is the steady state current in 2 Ω resistor as shown Fig. 9 ? Internal resistance of the battery is negligible and value of the capacitance C is 0.2 μF :

Fig. 9

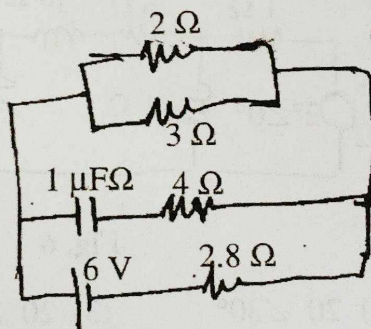(1) 1.5 A   (2) 1.2 A   (3) 0.6 A   (4) 0.9 A

7. Fourier Transform of $-a^n u(-n-1)$ is :

(1) $\dfrac{1}{1+ja\omega}$ (2) $\dfrac{1}{1-ja\omega}$ (3) $\dfrac{1}{1+ae^{-j\omega}}$ (4) $\dfrac{1}{1-ae^{j\omega}}$

8. The number of complex multiplications and complex additions involved in the direct computation of δ-point DFT :

(1) 64 & 56   (2) 8 & 16   (3) 64 & 64   (4) 64 & 8

9. Non-linearity in the relationship between Ω and ω is known as :

    (1) aliasing   (2) frequency warping

    (3) unwarping   (4) frequency mixing

10. For rectangular window, the peak side lobe magnitude in dB is :

    (1) −58 dB   (2) −41 dB   (3) −31 dB   (4) − 13 dB

11. Which one of the following sets of equations is independent of Maxwell's equations ?

    (1) Two curl equations

    (2) Two divergence equations

    (3) Both curl and divergence equations

    (4) Two curl equations combined with continuity equation

12. The lowest frequency at which a uniform plane wave incident from region 1 onto the boundary at $z = 0$ will have no reflection is :

    (1) 45°   (2) 30°   (3) 90°   (4) 60°

13. A receiving antenna is located 100 m away from the transmitting antenna. If the effective area of the receiving antenna is 500 cm^2 and the power density at the receiving location is 2 mW/m^2, the total power received is :

    (1) 10 µW   (2) 100 nW   (3) 100 µW   (4) 10 nW

14. Which of these is *not* true of a lossless line ?

    (1) $Z_{in} = -j\, Z_0$ for a shorted line with $l = \lambda/8$

    (2) $Z_{in} = Z_0$ for a mached line

    (3) $Z_{in} = j\,\infty$ for a shorted line with $l = \lambda/4$

    (4) All of the above

15. Which of the following potentials does *not* satisfy Laplace's equation ?

    (1) $V = 2x + 5$

    (2) $V = \rho \cos \phi + 10$

    (3) $V = r \cos \phi$

    (4) $V = \dfrac{10}{r}$

16. By saying that the electrostatic field is conservative, we do *not* mean that :

    (1) It is the gradient of a scalar potential

    (2) Its circulation is identically zero

    (3) Its curl is identically zero

    (4) The potential difference between any point is zero

17. A zero mean white Gaussian noise is passed through an ideal low pass filter of bandwidth 10 kHz. The output of the samples so obtained would be :

    (1) Correlated

    (2) Statistically independent

    (3) Incorrelated

    (4) Orthogonal

18. If in a broadcasting studio, a 1000 kHz carrier is modulated by an audio signal of frequency range 100-5000 kHz, the width of channel is :

    (1) 5 kHz   (2) 4.9 kHz   (3) 995 kHz   (4) 10 kHz

19. The bit rate of the digital communication system is MKBPS. The modulation used is 16 QAM. The minimum bandwidth required for ideal transmission is :

    (1) M/2 kHz   (2) M/16 kHz   (3) MHz   (4) M/8 kHz

20. The noise performance of a square low demodulator of AM signal is :

    (1) better than that of an envelope detector

    (2) better than that of a synchronous detector

    (3) identical than that of a synchronous detector

    (4) poorer than that of envelope detector

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21. Which of the following is **not** a characteristic of an ideal transducer ?

    (1) low noise

    (2) high repeatability

    (3) high dynamic range

    (4) low linearity

22. The .... characteristics of transducer refer to the performance of the transducer when it is subject to time varying signal.

    (1) Dynamic   (2) Static   (3) Transiant   (4) Both (1) and (2)

23. High Q coils inductance can be precisely measured by :

    (1) Maxwells inductance bridge

    (2) Hay's bridge

    (3) Schering bridge

    (4) Anderson's bridge

24. The device which is used for making temporary measurements of flow is :

    (1) Venturi

    (2) Dull flow tube

    (3) Orfice plate

    (4) Pitot static tube

25. The response $c(t)$ of a system is described by the differential equation $\dfrac{d^2}{dt^2}c(t) + 4\dfrac{d}{dt}c(t) + 5c(t) = 0$. The system response is :

    (1) Undamped

    (2) Under damped

    (3) Critically damped

    (4) Oscillatory

26. Consider the following amplifier with –ive feedback :
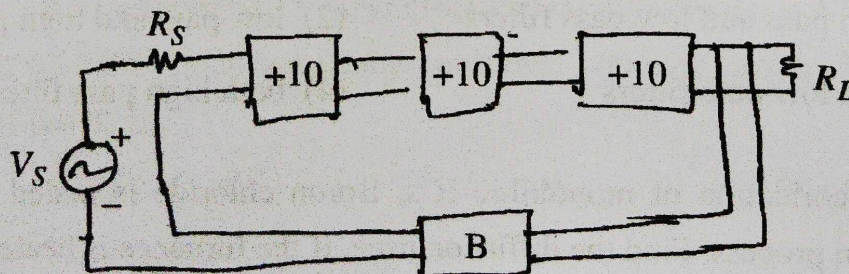
If the closed loop gain of the above amplifier is +100, the value of B will be :

    (1) -11×10^3 (2) $+11 \times 10^3$ (3) -9×10^3 (4) $+9 \times 10^3$

6

27. A system has open loop transfer function $G(s) = \dfrac{10}{s(s+1)(s+3)}$, what is the steady state error when it is subjected to the input $r(t) = 10 + 2t + 3/2t^2$?

(1) 0.4

(2) 4

(3) infinity

(4) none of these

28. The given characteristics polynomial $s^4 + s^3 + 2s^2 + 2s + 3 = 0$ has :

(1) zero root in RHS in s-plane

(2) one root in RHS of s-plane

(3) two roots in RHS of s-plane

(4) three roots in RHS of s-plane

29. Consider the following statements :

In root-locus plot, the breakaway points

(a) need not always be on real axis alone

(b) must lie on root loci

(c) must lie on 0 and 1

Which of these statements are **correct** ?

(1) (a) and (b)

(2) (b) and (c)

(3) (a) and (c)

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

30. With regard to the filtering property, the lead compensator and the lag compensator are respectively :

(1) high pass and low pass filters

(2) low pass and high pass filters

(3) both low pass filters

(4) both high pass filters

31. In the fabrication of monolithic ICs, Boron chloride is added as an impurity in the diffusion process. Find the diffusion time, if the furnance is heated upto 1200°C.

(1) 01 hour

(2) 02 hours

(3) 35 minutes

(4) 20 minutes

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32. How the aluminium film coating is carried out in metalization process ?

(1) Heating and Pouring aluminium in required place

(2) Placing the aluminium in required place and then heating it using tungsten

(3) Aluminium is vaccum evaporated and then condensed

(4) None of the mentioned

33. The burried layer reduces collector series resistance by providing :

(1) A low resistivity current path from n-type layer to n^+ contact layer

(2) A low resistivity current path from p-type layer to n^+ contact layer

(3) A high resistivity current path from n-type layer to n^+ contact layer

(4) A high resistivity current path from p-type layer to n^+ contact layer

34. The carrier density in the channel in the constant voltage model is scaled as :

(1) $1/\beta$ (2) 1

(3) β (4) All of the mentioned

35. The parameter which is *not* scaled to any factor is :

(1) Power speed product   (2) Switching energy

(3) Channel resistance   (4) All of the mentioned

36. A digital CMOS IC operating at 15 MHz clock frequency consumes 130 mW, the same IC operating at 10 MHz clock frequency consumes 100 mW power. The static power consumption of the IC is :

(1) 20 mW   (2) 40 mW   (3) 50 mW   (4) 90 mW

37. What should be the width of metal 1 and metal 2 layers ?

(1) $3\lambda, 3\lambda$ (2) $2\lambda, 3\lambda$ (3) $2\lambda, 4\lambda$ (4) $3\lambda, 4\lambda$

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38. .... are used in thick and thin film ICs, as individual components from outside.

    (1) Transistors

    (2) Active elements

    (3) Diode

    (4) All of the mentioned

39. Growth of SiO_2 on Si substrate can be achieved in two ways either using oxygen or using water vapour for growing thicker oxides ?

    (1) dry oxidation can be used

    (2) wet oxidations can be used

    (3) any of dry & wet can be used

    (4) dry oxidation followed by wet oxidation

40. If P is development, Q is etching, R is alignment & exposure and S is photoresist stripping then the order in which they are carried out in a standard photolithography process is :

    (1) P-Q-R-S   (2) Q-P-S-R   (3) P-S-R-Q   (4) R-P-Q-S

41. The abrupt truncation of Fourier series results in oscillations in :

    (1) both pass band & stop band

    (2) only pass band

    (3) only stop band

    (4) none of these

42. The trigonometric Fourier series representation of a function with half wave symmetry consists of :

    (1) even hormonics

    (2) old hormonics

    (3) sine terms only

    (4) cosine terms only

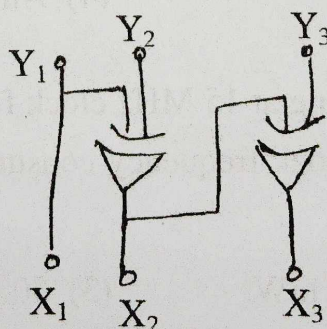43. The circuit as shown in Fig. 10 converts a binary code Y_1 Y_2 Y_3 into :

Fig. 10

    (1) Hamming code

    (2) BCD code

    (3) Gray code

    (4) Excess 3-code

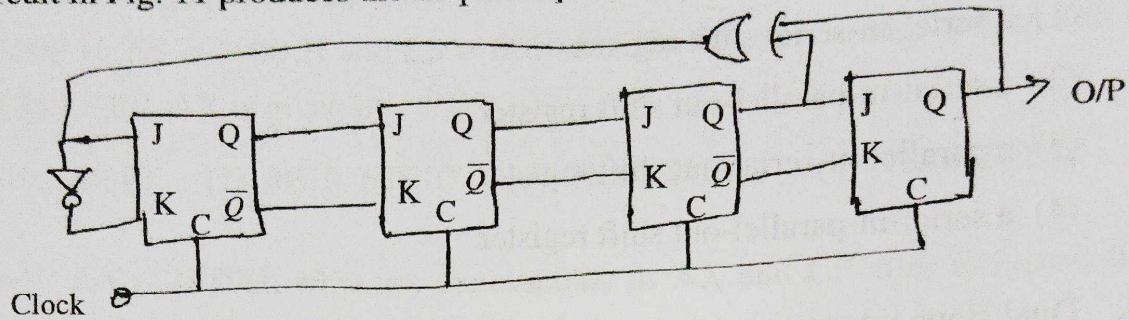**44.** The circuit in Fig. 11 produces the output sequence :

Fig. 11

(1) 1111   1111   0000   0000

(2) 1111   0000   1111   0000

(3) 1111   0001   0011   0100

(4) 1010   1010   1010   1010

45. If initially register contains byte B7H, then after 04 clock pulses, the contents of register will be shown in Fig. 12 :
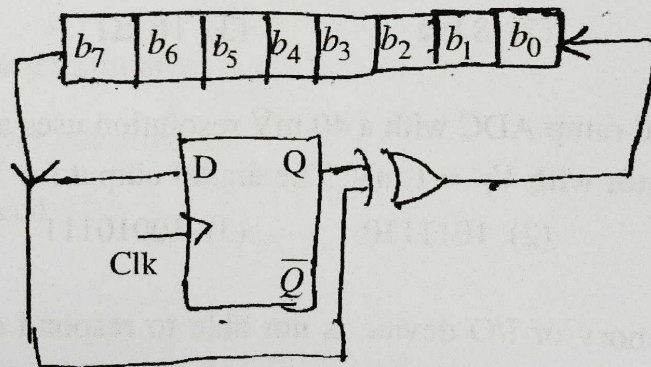

Fig. 12

(1) 7C   (2) 7E   (3) 7A   (4) 74

46. A switch-tail ring counter is made by using a single D-FF. The resulting circuit is :

(1) SR Flip-flop   (2) JK Flip-flop

(3) D-FF   (4) T-FF

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47. A pulse train can be delayed by a finite number periods usings of clock :

(1) a sericl-in-serial shift register

(2) a serial-in-parallel-out shift register

(3) a parallel-in-serial-out shift register

(4) a serial-in-parallel-out shift register

48. Dual slope integration type analog to digital converters provide :

(1) higher speeds compared to all other types of A/D conveters

(2) poor rejection of power supply hum

(3) better resolution compared to all other types of A/D converters for the same number of bits

(4) very good accuracy without putting extreme requirements on component stability

49. In a 4-bit weighted resistor D/A converter, the resister value corresponding to MSB will be :

(1) $4\,k\Omega$ (2) $8\,k\Omega$ (3) $16\,k\Omega$ (4) $32\,k\Omega$

50. An 8-bit digital ramp ADC with a 40 mV resolution uses a clock frequency of 2.5 MHz and a comparator with $V_T = 1$ mV. The digital output for $V_A = 6.000$ V is :

(1) 1011111   (2) 1011110   (3) 10010111   (4) 10010110

51. When the memory or I/O device is not able to respond quickly, wait states (Tw) are inserted between ………….. by ………….. the READY input of the 8086.

(1) T_3 & T_4 disabling   (2) T_2 & T_3 disabling

(3) T_1 & T_2 enabling   (4) T_3 & T_4 enabling

52. AL, AX and DX registers of 8086 are used in following instructions :

(1) Multiply, Divide, I/O and Translate

(2) Multiply, Divide, I/O and Decimal adjustments

(3) Multiply, Divide, I/O, Translate and Decimal adjustments

(4) Multiply, Divide and I/O

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53. If [BX] = 1234 H, [BP] = 2490 H, AX = 1000 H, LIST = 5980 H, CS = 3000 H, DS = 2000 H, ES = 5000 H and SS = 6000 H. The effective and physical address of MOV LIST [BP], AX is given by :

(1) 8E10, 28E10   (2) 8E10, 68E10   (3) 7E10, 27E10   (4) 7E10, 67E10

54. If CF = 1, AX = 1F89H, what are the contents of AX and CF after the execution of following instructions ?

MOV CL, 2

RCL AX, CL

(1) AX = 2A6BH & CF = 1   (2) AX = 7EA6H & CF = 0

(3) AX = 7FB7H & CF = 0   (4) AX = 0F89H & CF = 1

55. Why is CHMOS technology preferred over HMOS technology for designing devices of MCS-51 family ?

(1) Due to higher noise immunity

(2) Due to lower power consumption

(3) Due to higher speed

(4) All of the above

56. Which is the only register without internal on-chip RAM address in MCS-51 ?

(1) Stack pointer   (2) Program counter

(3) Data printer   (4) Timer register

57. Which among the below mentioned functions does *not* belong to the category of alternate functions performed by Port-3 (Pins 10-17) ?

(1) Read/write control signals   (2) Serial ports

(3) Internal interrupts   (4) External interrupts

58. How many single byte, two byte and three byte instructions are supported by MCS-51 for overall instruction sent ?

(1) 45 single byte, 45 two bytes and 17 three bytes

(2) 45 single byte, 45 two bytes and 15 three bytes

(3) 55 single byte, 40 two bytes and 20 three bytes

(4) 40 single byte, 55 two bytes and 17 three bytes

59. Which rotate instructions has an ability to modify CY flag by moving the bit-7 & bit-0 respectively to accumulator ?

(1) RR & RL   (2) RRC & RLC   (3) RR & RLC   (4) RL & RLC

60. Which instructions affect the program counter ?

(1) CALL & RETURN   (2) RETURN & JUMP

(3) PUSH & POP   (4) CALL & JUMP

61. Fermi level for intrinsic semiconductor lies :

(1) At middle of the band gap   (2) Close to conduction band

(3) Close to valence band   (4) None

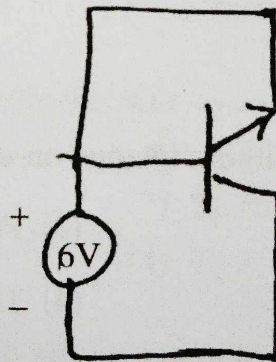**62.** Consider the transistor shown in Fig. 1 :

Fig. 1

The transistor is operating in :

(1) Forward-Active region   (2) Reverse-Active region

(3) Saturation region   (4) Cut off region

B

63. The electron concentration in silicon decreases linearly from 10^{16} cm^{-3} to 10^{15} cm^{-3} over a distance of 0.10 cm. The cross-sectional area of sample is 0.05 cm^2. The electron diffusion coefficient, D_n is given by 25 cm^2/sec. The diffusion current in silicon will be :

(1) 0.36 mA   (2) 3.6 mA   (3) 0.18 mA   (4) 18 mA

64. A silicon p$^+$n junction has doping concentration of $N_a = 10^{18}$ cm^{-3} and $N_d = 5 \times 10^{15}$ cm^{-3}. The cross-sectional area of the junction is A $= 5 \times 10^{-5}$ cm^2, what will be the capacitance for the applied reverse voltage, $V_R = 3$ V ?

(1) 0.521 pF   (2) 0.005 nF   (3) 1.04 nF   (4) 2.61 nF

65. Consider on MOS structure with p-type silicon and $N_a = 6 \times 10^{15}$ cm^{-3}. If the gate is aluminium then the metal semiconductor work function difference, ϕ_{ms} of the MOS structure will be :

(1) −2.256 V   (2) −0.944 V   (3) 7.344 V   (4) 4.144 V

66. The phenomenon known as "Early Effect" in a bipolar transistor refers to a reduction of base-width caused by :

(1) Electron-hole recombination base
(2) The forward biasing of emitter-base junction
(3) The early removal of stored base charge during saturation to cut-off region
(4) The reverse biasing of base-collector junction

67. The common short circuit current gain β of a transistor :

(1) is a monotonically increasing function of collector current I_C
(2) is a monotonically decreasing function I_C
(3) increasing with I_C, for low I_C reaches a maximum and then decrease with further increase in I_C
(4) is not a function of I_C

68. The built-in-potential (diffusion potential) in a pn-junction :

(i) increases with increase in temperature
(ii) increases with increase in doping in the dioping levels of two sides
(iii) is equal to the average of the Fermi levels of two sides
(iv) is equal to the difference of the Fermi levels of two sides
Which of the following statement is *correct* ?

(1) (i), (ii) & (iv)   (2) (i) & (ii)   (3) (ii) & (iii)   (4) (i) & (iv)

B

B

69. The current gain of the transistor as shown in Fig. 2 is $\beta = 125$. The Q-point values $(I_{CQ}$ & $V_{CEQ})$ are :
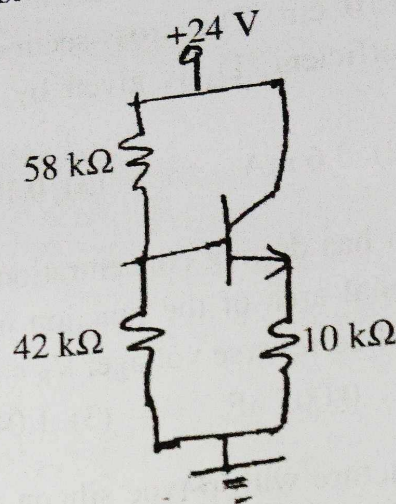
+24 V

58 kΩ

42 kΩ

10 kΩ

Fig. 2

(1) 0.418 mA & 20.4 V

(2) 0.913 mA & 16.23 V

(3) 0.913 mA & 14.8 V

(4) 0.418 mA & 18.43 mV

70. The collector to emitter cut-off current (I_{CEO}) to base cut-off current (I_{CBO}) is .... as α is the CB current gain of transistor :

(1) $I_{CEO} = I_{CBO}$ (2) $I_{CEO} = \alpha\, I_{CBO}$ (3) $I_{CEO} = \dfrac{I_{CBO}}{1 + \alpha}$ (4) $I_{CEO} = \dfrac{I_{CBO}}{1 - \alpha}$

71. Which of the following options about tunnel diodes is **incorrect** ?

(1) The width of depletion region is high as compared to the p-n junction.

(2) Impurity concentration is high as compared to p-n junction.

(3) The V-I characteristics show the negative resistance region.

(4) Carrier velocities are very high.

72. The following structures are used in High Electron Mobility Transistor :

(1) Diffusion & self aligned ion implanted structure

(2) Recess gate structure

(3) Self aligned ion implented structure & recess gate structure

(4) Diffusion & recess gate structure

PHD

73. Preliminary filtration is one of the steps used in the liquid phase purification method of CNT. What is its purpose ?
    (1) To remove bulk solid particles
    (2) To remove bulk graphite particles
    (3) To remove fullerences and catalysts
    (4) To isolate MWCNT

74. By nano scale distribution of the .... in matrix improves the life and performance.
    (1) Carbide
    (2) Hydrides
    (3) Tungesten
    (4) Nitrides

75. Solar cell is made from bulk materials that is cut into water of .... thickness.
    (1) 120-180 μm
    (2) 120-220 μm
    (3) 180-220 μm
    (4) 180-240 μm

76. An LCD requires a power of .... to light up are segment of a seven segment display system.
    (1) 20 μm
    (2) 10 mW
    (3) 10 nW
    (4) 02 μW

77. An abrupt silicon pn-junction has dopant concentration of $Na = 2 \times 10^{16}$ cm^{-3} and $Nd = 2 \times 10^{15}$ cm^{-3} at T = 300 K. A reverse voltage of $V_R = 8$ V is applied to the pn-junction. What will be the maximum electric field in the depletion region ?
    (1) 3.23×10^5 V/cm
    (2) 3.5×10^4 V/cm
    (3) 7.0×10^4 V/cm
    (4) 6.45×10^5 V/cm

78. The impurity level in an extrinsic semiconductor about .... of pure semiconductor.
    (1) 10 atoms for 108 atoms
    (2) 1 atom for 108 atoms
    (3) 1 atom for 104 atoms
    (4) 1 atom for 100 atoms

79. When the temperature of an extrinsic semiconductor is increased, the pronounced effect is on ....
    (1) Minority carriers
    (2) Majority carriers
    (3) Minority & Majority carriers
    (4) Junction capacitance

80. Mobility of holes is .... mobility of electrons in intrinsic semiconductors.
    (1) Equal
    (2) Greater than
    (3) Less than
    (4) Cannot define

81. If carrier modulated by a digital bit stream has one of the possible phases of 0°, 90°, 180° and 270°, then the modulation is called :

(1) BPSK   (2) QPSK   (3) QAM   (4) MSK

82. A signal having uniformly distributed amplitude in the interval $(-V, +V)$ is to be encoded using PCM with uniform quantization. The signal to quantization noise is determined by the :

(1) number of quantizing levels   (2) sampling rate

(3) dynamic range to the signal   (4) power spectrum of signal

83. In asynchronous TDM, for n signal sources, each frame contains m slots, where m is usually :

(1) $2n$ (2) greater than $2n$

(3) n (4) less than n

84. An optical fiber behaves as a birefringence medium due to differences in :

(1) Effective R-I and core geometry

(2) Core-cladding symmetry

(3) Transmission/propagation time of waves

(4) Refractive indices of glass & silica

85. A single node fiber has mode field diameter 10.2 μm and $V = 2.20$. What is the core diameter of this fiber ?

(1) 11.1 μm   (2) 13.2 μm   (3) 7.6 μm   (4) 10.1 μm

86. A multimode step index fiber has source of RMS spectral width of 60 nm and dispersion parameter for fiber is 150 psn $m^{-1}km^{-1}$. Estimate rms pulse broadening due to material dispersion :

(1) 12.5 ns km^{-1} (2) 9.6 ns km^{-1} (3) 9.0 ns km^{-1} (4) 10.2 ns km^{-1}

87. A compared to planar LED structure, Dome LEDs have .... external power efficiency .... effective emission area and .... radiance.

(1) greater, lesser, reduced

(2) higher, greater, reduced

(3) higher, lesser, increased

(4) greater, greater, increased

88. The wavelength of RAPD with 70% efficiency and responsibility 0.689 A/W is given by :

(1) 06 μm

(2) 7.21 μm

(3) 0.112 μm

(4) 03 μm

89. An RC Snubber circuit is used to protect a thysistor against :

(1) false triggering

(2) failure to turn on

(3) switching transiants

(4) failure to commutate

90. What is the backup duration for 600 VA UPS ?

(1) 30 to 45 minutes

(2) 15 to 20 minutes

(3) 01 to 05 minutes

(4) 05 to 10 minutes

91. In a MOSFET the threshold voltage can be lowered by :

(1) increasing the gate oxide thickness

(2) reducing the substrate concentration

(3) increasing the substrate concentration

(4) using the dielectric of lower constant

92. The disadvantage of capacitor input LC filter in rectifier is :

(1) high cost, more weight and external field produced by series inductor

(2) high cost, moderate weight and no external field produced by series inductor

(3) high cost, less weight

(4) low cost, more weight

93. Which of the following architecture can be designed as an instrumentation amplifier ?

(1) Indirect current feedback

(2) Direct current feedback

(3) Indirect voltage feedback

(4) Direct voltage feedback

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P. T. O.

94. The circuit as shown in Fig. 3, $V_O = V_{OA}$ for switch SW in position A and $V_O = V_{OB}$ for switch SW in position B. Assume that op amp is ideal. The value of $\dfrac{V_{OB}}{V_{OA}}$ is :
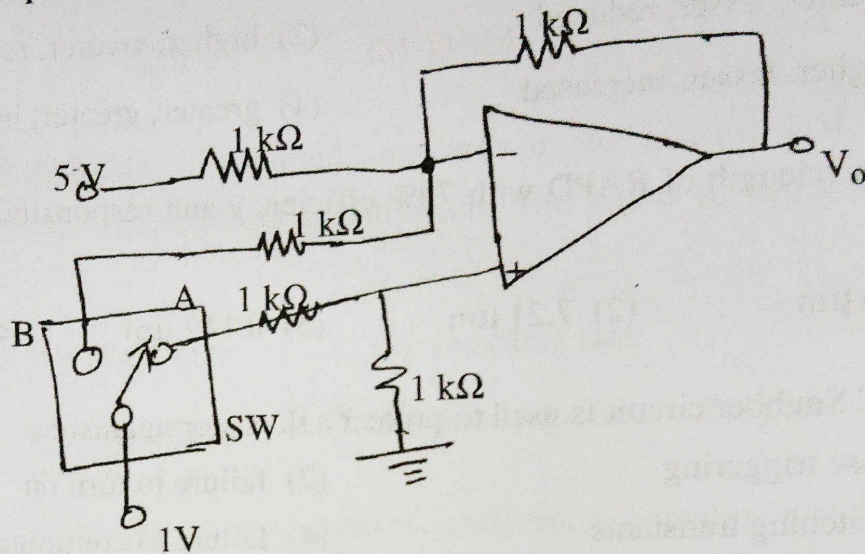

Fig. 3

(1) 3 (2) 0.5 (3) 2 (4) 1.5

95. In the differential amplifier as shown in Fig. 4, the magnitude of the common-mode and diferential-mode gains are A_{cm} and A_d, respectively. If the resistance R_E is increased, then :
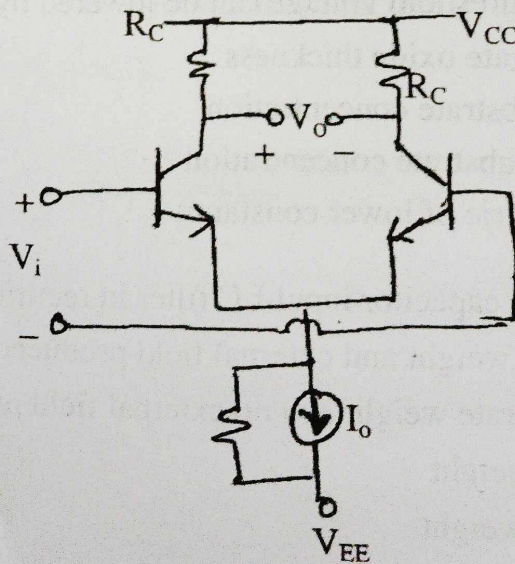

Fig. 4

(1) A_{cm} increases
(2) A_d increases
(3) Common-mode rejection ratio increases
(4) Common-mode rejection ratio decreases

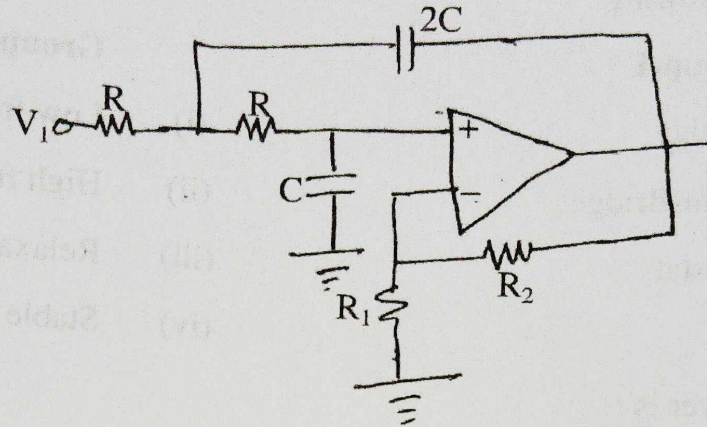**96.** Consider the following statements regarding the circuit as shown in Fig. 5

Fig. 5

(i) The circuit represents an active low pass filter.

(ii) The circuit represents a second order active filter.

(iii) The circuit has a cut-off rate of 40 dB has decade.

(1) (i), (ii) & (iii) are correct

(2) (i) & (ii) are correct

(3) Only (i) is correct

(4) (ii) & (iii) are correct

97. An op-amp has open loop gain of 10^5 and an open loop cut-off frequency of 10 Hz. If this op-amp is connected as an amplifier with a closed gain of 100, then the new upper cut-off frequency is :

(1) 100 kHz

(2) 1000 kHz

(3) 10 Hz

(4) 10 kHz

98. .... converts Direct Current (DC) signals from the power supply units to Alternate Current (AC) signals.

(1) micro controllers

(2) oscillators

(3) transformers

(4) relays

99. Which one of the following is an audio frequency oscillator ?

(1) Wein bridge

(2) Hartlay

(3) Colpitts

(4) Crystal

PHD-EE-2023-24/(Elect. & Comm. Engg.)(SET-X)/(B)

P. T. O.

100. Match the following :

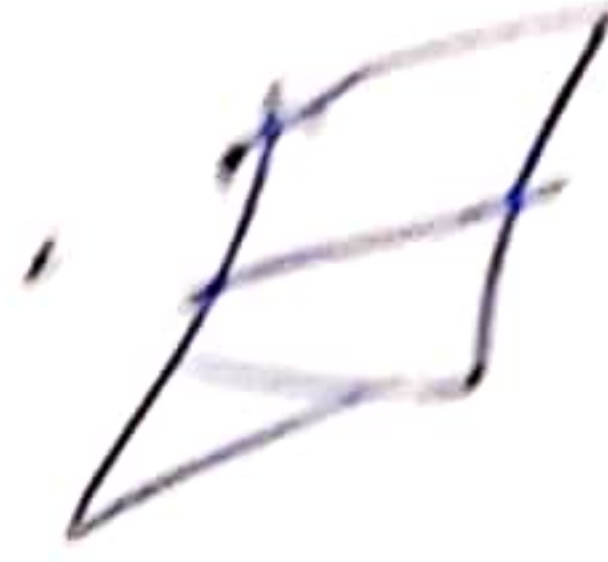| Group-I		Group-II	
(A)	Hartlay	(i)	Low frequency oscillator
(B)	Wein-Bridge	(ii)	High frequency oscillator
(C)	Crystal	(iii)	Relaxation oscillator
		(iv)	Stable frequency oscillator

Correct answer is :

(1) A-i, B-iii, C-ii

(2) A-ii, B-1, C-iv

(3) A-iv, B-i, C-ii

(4) A-i, B-ii, C-iv

1. Fermi level for intrinsic semiconductor lies :

   (1) At middle of the band gap (2) Close to conduction band

   (3) Close to valence band (4) None
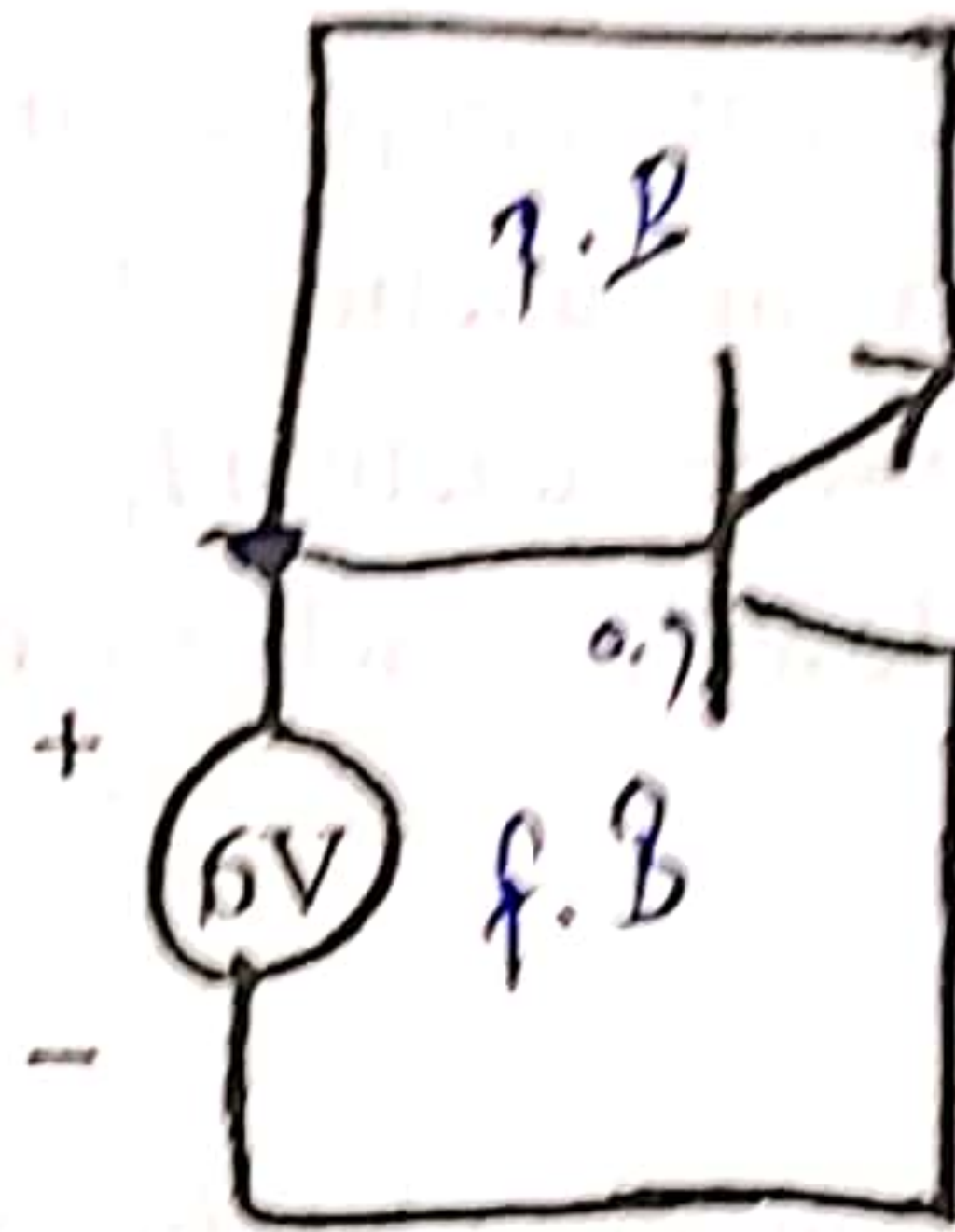
2. Consider the transistor shown in Fig. 1 :

Fig. 1

   The transistor is operating in :

   (1) Forward-Active region (2) Reverse-Active region

   (3) Saturation region (4) Cut off region

3. The electron concentration in silicon decreases linearly from 10^{16} cm^{-3} to 10^{15} cm^{-3} over a distance of 0.10 cm. The cross-sectional area of sample is 0.05 cm^2. The electron diffusion coefficient, D_n is given by 25 cm^2/sec. The diffusion current in silicon will be :

   (1) 0.36 mA (2) 3.6 mA (3) 0.18 mA (4) 18 mA

4. A silicon p$^+$n junction has doping concentration of $N_a = 10^{18}$ cm^{-3} and $N_d = 5 \times 10^{15}$ cm^{-3}. The cross-sectional area of the junction is $A = 5 \times 10^{-5}$ cm^2, what will be the capacitance for the applied reverse voltage, $V_R = 3$ V ?

   (1) 0.521 pF (2) 0.005 nF (3) 1.04 nF (4) 2.61 nF

5. Consider on MOS structure with p-type silicon and $N_a = 6 \times 10^{15}$ cm^{-3}. If the gate is aluminium then the metal semiconductor work function difference, ϕ_{ms} of the MOS structure will be :

   (1) −2.256 V (2) −0.944 V (3) 7.344 V (4) 4.144 V

~~Nice~~ (handwritten)   C

6. The phenomenon known as "Early Effect" in a bipolar transistor refers to a reduction of base-width caused by :

(1) Electron-hole recombination base

(2) The forward biasing of emitter-base junction

~~(3)~~ The early removal of stored base charge during saturation to cut-off region

(4) The reverse biasing of base-collector junction

7. The common short circuit current gain β of a transistor :

(1) is a monotonically increasing function of collector current I_C

(2) is a monotonically decreasing function I_C

~~(3)~~ increasing with I_C, for low I_C reaches a maximum and then decrease with further increase in I_C

(4) is not a function of I_C

8. The built-in-potential (diffusion potential) in a pn-junction : V_{bi} (handwritten)

(i) increases with increase in temperature

(ii) increases with increase in doping in the dioping levels of two sides

(iii) is equal to the average of the Fermi levels of two sides

(iv) is equal to the difference of the Fermi levels of two sides

Which of the following statement is *correct* ?

(1) (i), (ii) & (iv)   (2) (i) & (ii)   (3) (ii) & (iii)   (4) (i) & (iv)

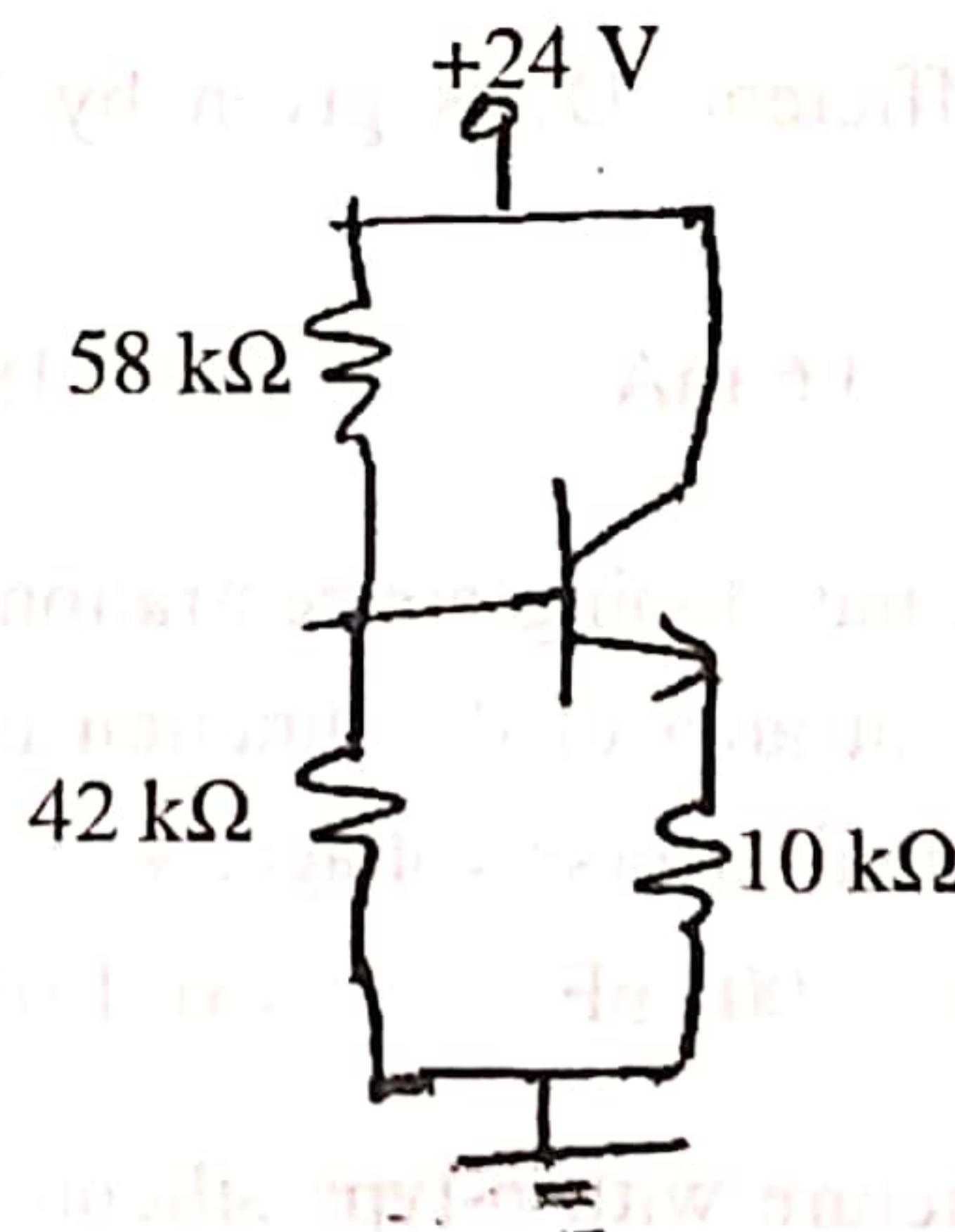**9.** The current gain of the transistor as shown in Fig. 2 is $\beta = 125$. The Q-point values (I_{CQ} & V_{CEQ}) are :

+24 V

58 kΩ

42 kΩ   10 kΩ

(handwritten notes in left margin: β = 125, I_CQ:, Vce G:, 58.42, 10 kΩ)

Fig. 2

(1) 0.418 mA & 20.4 V   (2) 0.913 mA & 16.23 V

(3) 0.913 mA & 14.8 V   (4) 0.418 mA & 18.43 mV

10. The collector to emitter cut-off current (I_{CEO}) to base cut-off current (I_{CBO}) is ………… as α is the CB current gain of transistor :

(1) $I_{CEO} = I_{CBO}$

(2) $I_{CEO} = \alpha \, I_{CBO}$

(3) $I_{CEO} = \dfrac{I_{CBO}}{1+\alpha}$

(4) $I_{CEO} = \dfrac{I_{CBO}}{1-\alpha}$

11. The abrupt truncation of Fourier series results in oscillations in :

(1) both pass band & stop band

(2) only pass band

(3) only stop band

(4) none of these

12. The trigonometric Fourier series representation of a function with half wave symmetry consists of :

(1) even hormonics

(2) old hormonics

(3) sine terms only

(4) cosine terms only

13. The circuit as shown in Fig. 10 converts a binary code $Y_1 \, Y_2 \, Y_3$ into :
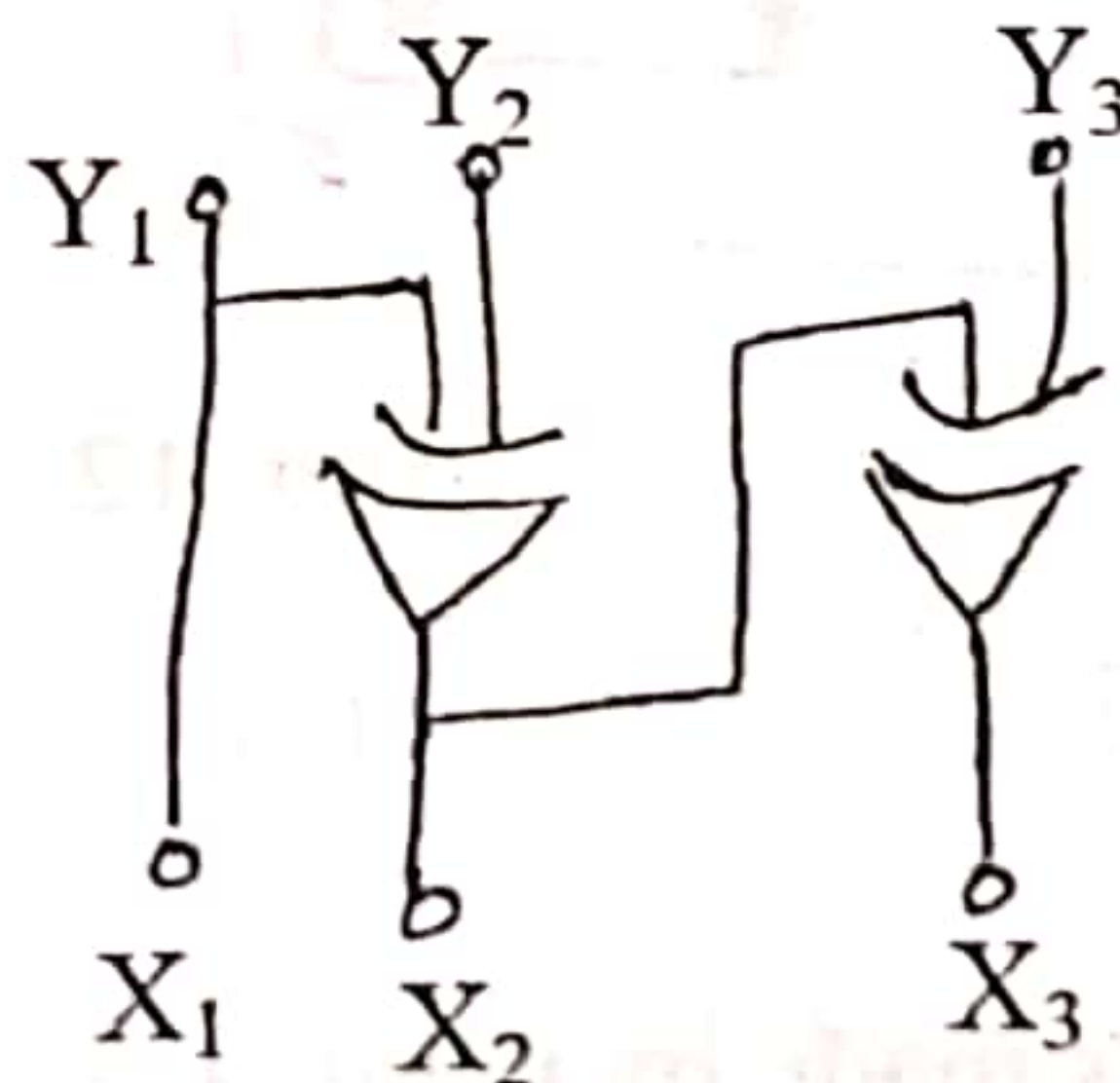

Fig. 10

(1) Hamming code

(2) BCD code

(3) Gray code

(4) Excess 3-code

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P. T. O.

14. The circuit in Fig. 11 produces the output sequence :

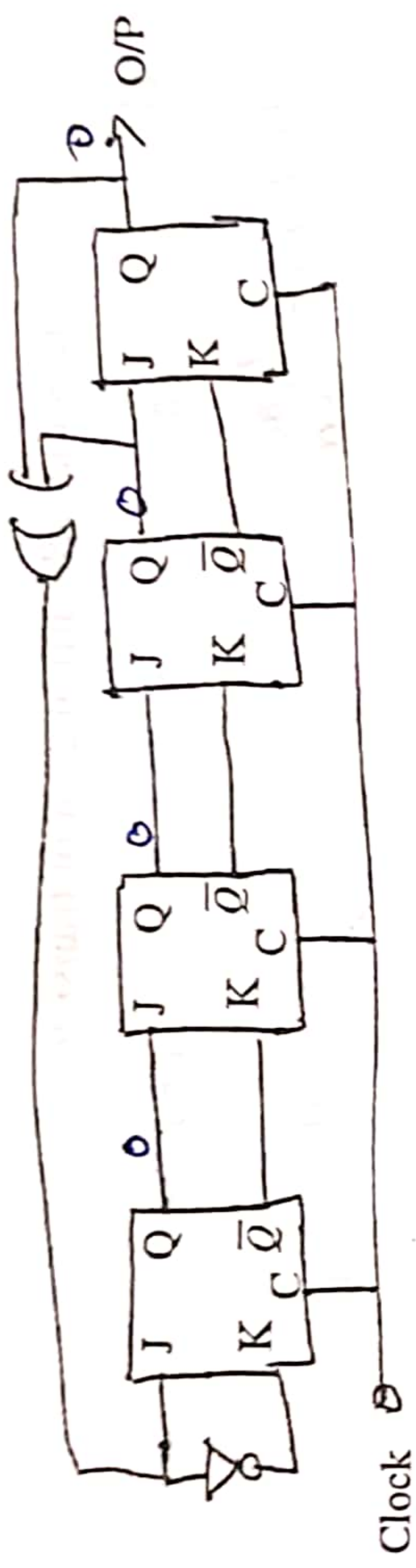**Fig. 11**

(1)	1111	1111	0000	0000
(2)	1111	0000	1111	0000
(3)	1111	0001	0011	0100
(4)	1010	1010	1010	1010

15. If initially register contains byte B7H, then after 04 clock pulses, the contents of register will be shown in Fig. 12 :
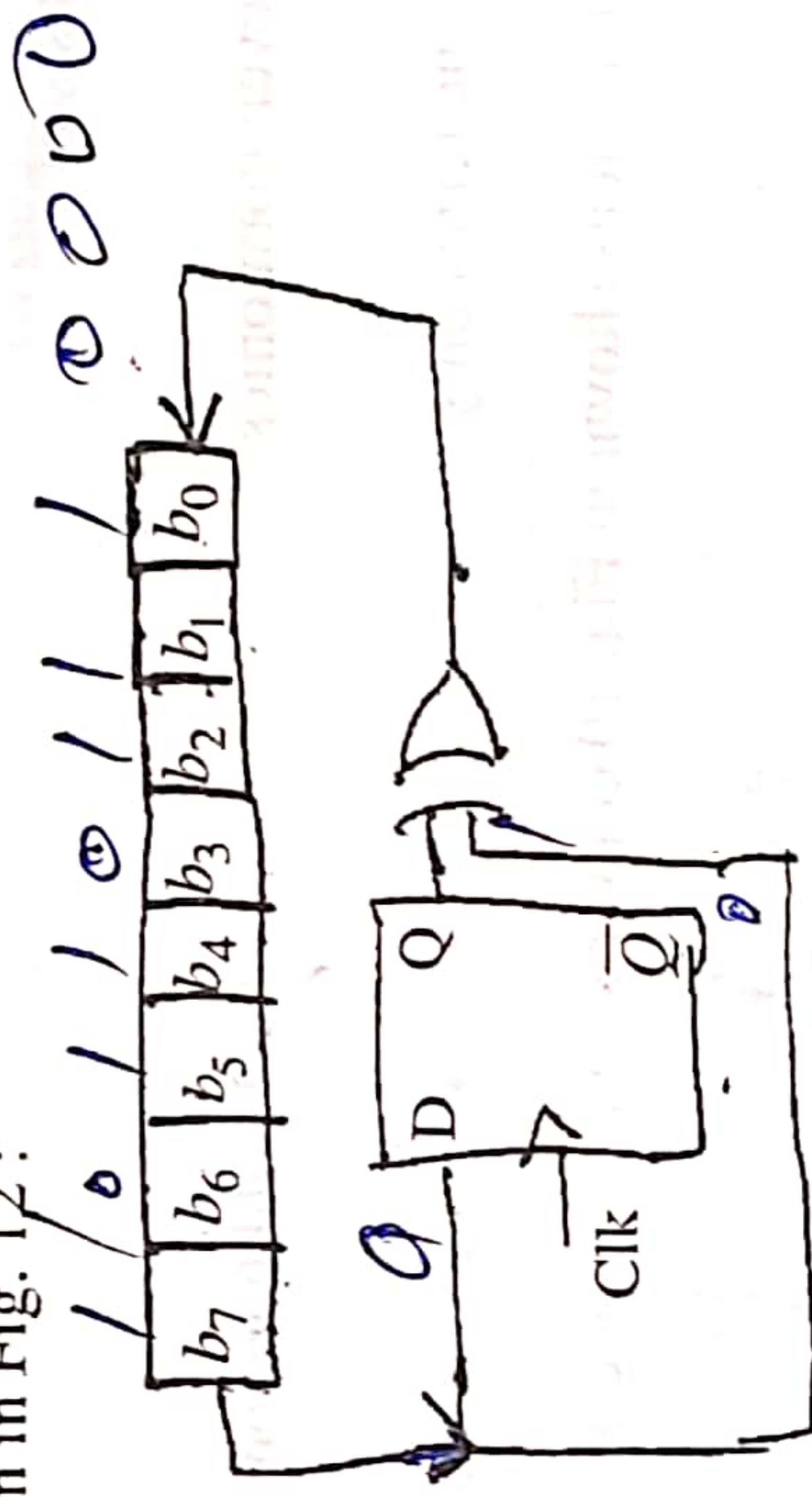

Fig. 12

(1) 7C   (2) 7E   (3) 7A   (4) 74

16. A switch-tail ring counter is made by using a single D-FF. The resulting circuit is :

(1) SR Flip-flop   (2) JK Flip-flop

(3) D-FF   (4) T-FF

17. A pulse train can be delayed by a finite number periods usings of clock :

(1) a seriel-in-serial shift register

(2) a serial-in-parallel-out shift register

(3) a parallel-in-serial-out shift register

(4) a serial-in-parallel-out shift register

18. Dual slope integration type analog to digital converters provide :

(1) higher speeds compared to all other types of A/D conveters

(2) poor rejection of power supply hum

(3) better resolution compared to all other types of A/D converters for the same number of bits

(4) very good accuracy without putting extreme requirements on component stability

19. In a 4-bit weighted resistor D/A converter, the resister value corresponding to MSB will be :

(1) $4 \, k\Omega$

(2) $8 \, k\Omega$

(3) $16 \, k\Omega$

(4) $32 \, k\Omega$

20. An 8-bit digital ramp ADC with a 40 mV resolution uses a clock frequency of 2.5 MHz and a comparator with $V_T = 1 \, mV$. The digital output for $V_A = 6.000$ V is :

(1) 1011111

(2) 1011110

(3) 10010111

(4) 10010110

21. If carrier modulated by a digital bit stream has one of the possible phases of 0°, 90°, 180° and 270°, then the modulation is called :

(1) BPSK

(2) QPSK

(3) QAM

(4) MSK

22. A signal having uniformly distributed amplitude in the interval $(-V, +V)$ is to be encoded using PCM with uniform quantization. The signal to quantization noise is determined by the :

(1) number of quantizing levels

(2) sampling rate

(3) dynamic range to the signal

(4) power spectrum of signal

6

23. In asynchronous TDM, for n signal sources, each frame contains m slots, where m is usually :

(1) $2n$

(2) greater than $2n$

(3) n

(4) less than n

24. An optical fiber behaves as a birefringence medium due to differences in :

(1) Effective R-I and core geometry

(2) Core-cladding symmetry

(3) Transmission/propagation time of waves

(4) Refractive indices of glass & silica

25. A single node fiber has mode field diameter 10.2 μm and V = 2.20. What is the core diameter of this fiber ?

(1) 11.1 μm

(2) 13.2 μm

(3) 7.6 μm

(4) 10.1 μm

26. A multimode step index fiber has source of RMS spectral width of 60 nm and dispersion parameter for fiber is 150 psn m^{-1}km^{-1}. Estimate rms pulse broadening due to material dispersion :

(1) 12.5 ns km^{-1}

(2) 9.6 ns km^{-1}

(3) 9.0 ns km^{-1}

(4) 10.2 ns km^{-1}

27. A compared to planar LED structure, Dome LEDs have .... external power efficiency .... effective emission area and .... radiance.

(1) greater, lesser, reduced

(2) higher, greater, reduced

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28. The wavelength of RAPD with 70% efficiency and responsibility 0.689 A/W is given by :

(1) 06 μm

(2) 7.21 μm

(3) 0.112 μm

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29. An RC Snubber circuit is used to protect a thysistor against :

(1) false triggering

(2) failure to turn on

(3) switching transiants

(4) failure to commutate

30. What is the backup duration for 600 VA UPS ?

    (1) 30 to 45 minutes

    (2) 15 to 20 minutes

    (3) 01 to 05 minutes

    (4) 05 to 10 minutes

31. Which one of the following sets of equations is independent of Maxwell's equations ?

    (1) Two curl equations

    (2) Two divergence equations

    (3) Both curl and divergence equations

    (4) Two curl equations combined with continuity equation

32. The lowest frequency at which a uniform plane wave incident from region 1 onto the boundary at $z = 0$ will have no reflection is :

    (1) 45°

    (2) 30°

    (3) 90°

    (4) 60°

33. A receiving antenna is located 100 m away from the transmitting antenna. If the effective area of the receiving antenna is 500 cm^2 and the power density at the receiving location is 2 mW/m^2, the total power received is :

    (1) 10 µW

    (2) 100 nW

    (3) 100 µW

    (4) 10 nW

34. Which of these is *not* true of a lossless line ?

    (1) $Z_{in} = -j\, Z_0$ for a shorted line with $l = \lambda/8$

    (2) $Z_{in} = Z_0$ for a mached line

    (3) $Z_{in} = j \infty$ for a shorted line with $l = \lambda/4$

    (4) All of the above

35. Which of the following potentials does *not* satisfy Laplace's equation ?

    (1) $V = 2x + 5$

    (2) $V = \rho \cos \phi + 10$

    (3) $V = r \cos \phi$

    (4) $V = \dfrac{10}{r}$

8

36. By saying that the electrostatic field is conservative, we do *not* mean that :

    (1) It is the gradient of a scalar potential

    (2) Its circulation is identically zero

    (3) Its curl is identically zero

    (4) The potential difference between any point is zero

37. A zero mean white Gaussian noise is passed through an ideal low pass filter of bandwidth 10 kHz. The output of the samples so obtained would be :

    (1) Correlated

    (2) Statistically independent

    (3) Incorrelated

    (4) Orthogonal

38. If in a broadcasting studio, a 1000 kHz carrier is modulated by an audio signal of frequency range 100-5000 kHz, the width of channel is :

    (1) 5 kHz

    (2) 4.9 kHz

    (3) 995 kHz

    (4) 10 kHz

39. The bit rate of the digital communication system is MKBPS. The modulation used is 16 QAM. The minimum bandwidth required for ideal transmission is :

    (1) M/2 kHz

    (2) M/16 kHz

    (3) MHz

    (4) M/8 kHz

40. The noise performance of a square low demodulator of AM signal is :

    (1) better than that of an envelope detector

    (2) better than that of a synchronous detector

    (3) identical than that of a synchronous detector

    (4) poorer than that of envelope detector

41. Which of the following options about tunnel diodes is *incorrect* ?

    (1) The width of depletion region is high as compared to the p-n junction.

    (2) Impurity concentration is high as compared to p-n junction.

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43. Preliminary filtration is one of the steps used in the liquid phase purification method of CNT. What is its purpose ?

(1) To remove bulk solid particles

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46. An LCD requires a power of .... to light up are segment of a seven segment display system.

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(2) 10 nW

(3) 10 nW

(4) 02 μW

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(1) 3.23×10^5 V/cm

(2) 3.5×10^4 V/cm

(3) 7.0×10^4 V/cm

(4) 6.45×10^5 V/cm

48. The impurity level in an extrinsic semiconductor about .... of pure semiconductor.

(1) 10 atoms for 108 atoms

(2) 1 atom for 108 atoms

(3) 1 atom for 104 atoms

(4) 1 atom for 100 atoms

49. When the temperature of an extrinsic semiconductor is increased, the pronounced effect is on ....

    (1) Minority carriers

    (2) Majority carriers

    (3) Minority & Majority carriers

    (4) Junction capacitance

50. Mobility of holes is .... mobility of electrons in intrinsic semiconductors.

    (1) Equal

    (2) Greater than

    (3) Less than

    (4) Cannot define

51. In a MOSFET the threshold voltage can be lowered by :

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    (2) reducing the substrate concentration

    (3) increasing the substrate concentration

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    (1) high cost, more weight and external field produced by series inductor

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    (3) high cost, less weight

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    (1) Indirect current feedback

    (2) Direct current feedback

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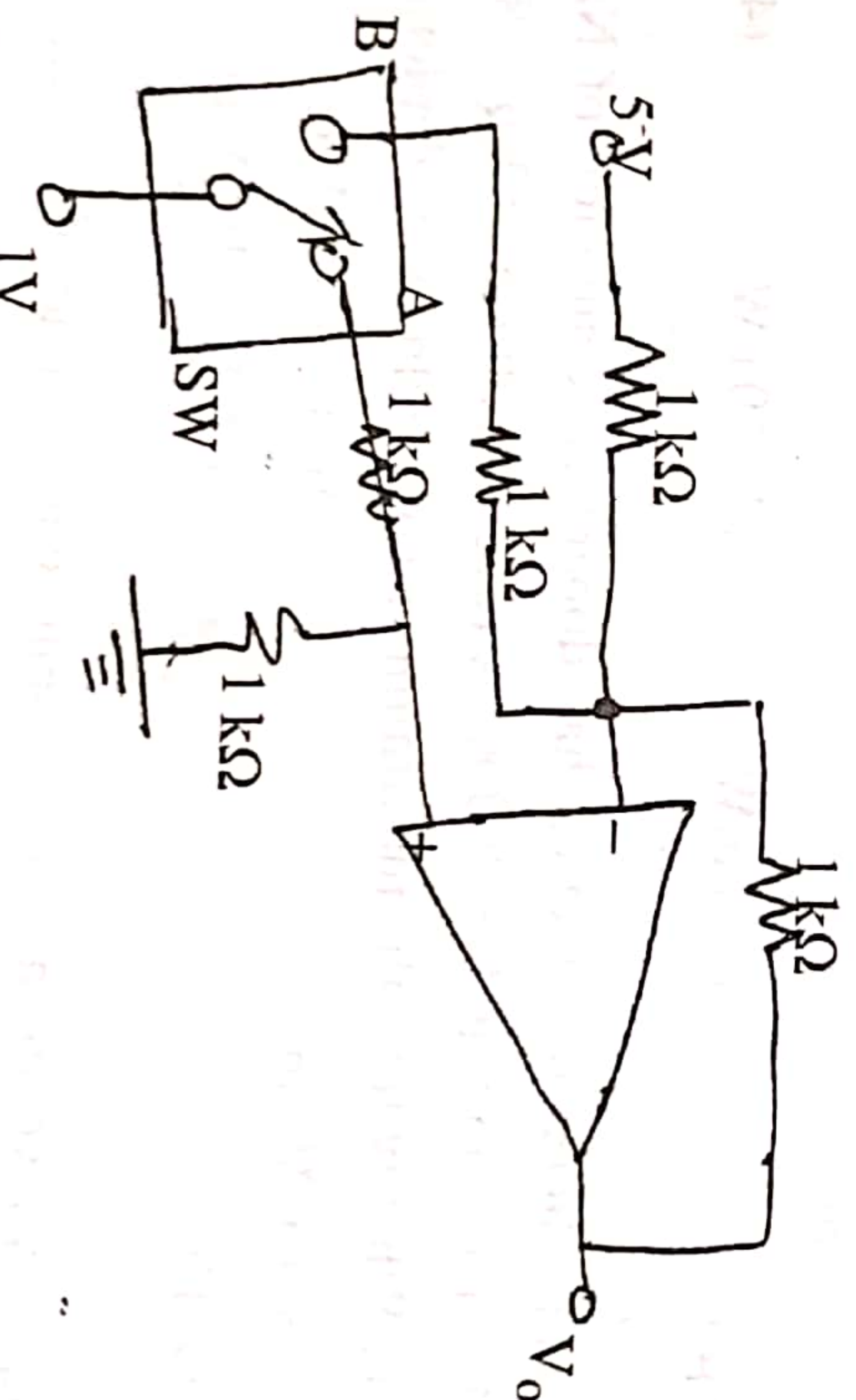

Fig. 3

    (1) 3

    (2) 0.5

    (3) 2

    (4) 1.5

55. In the differential amplifier as shown in Fig. 4, the magnitude of the common-mode and diferential-mode gains are A_{cm} and A_d, respectively. If the resistance R_E is increased, then :
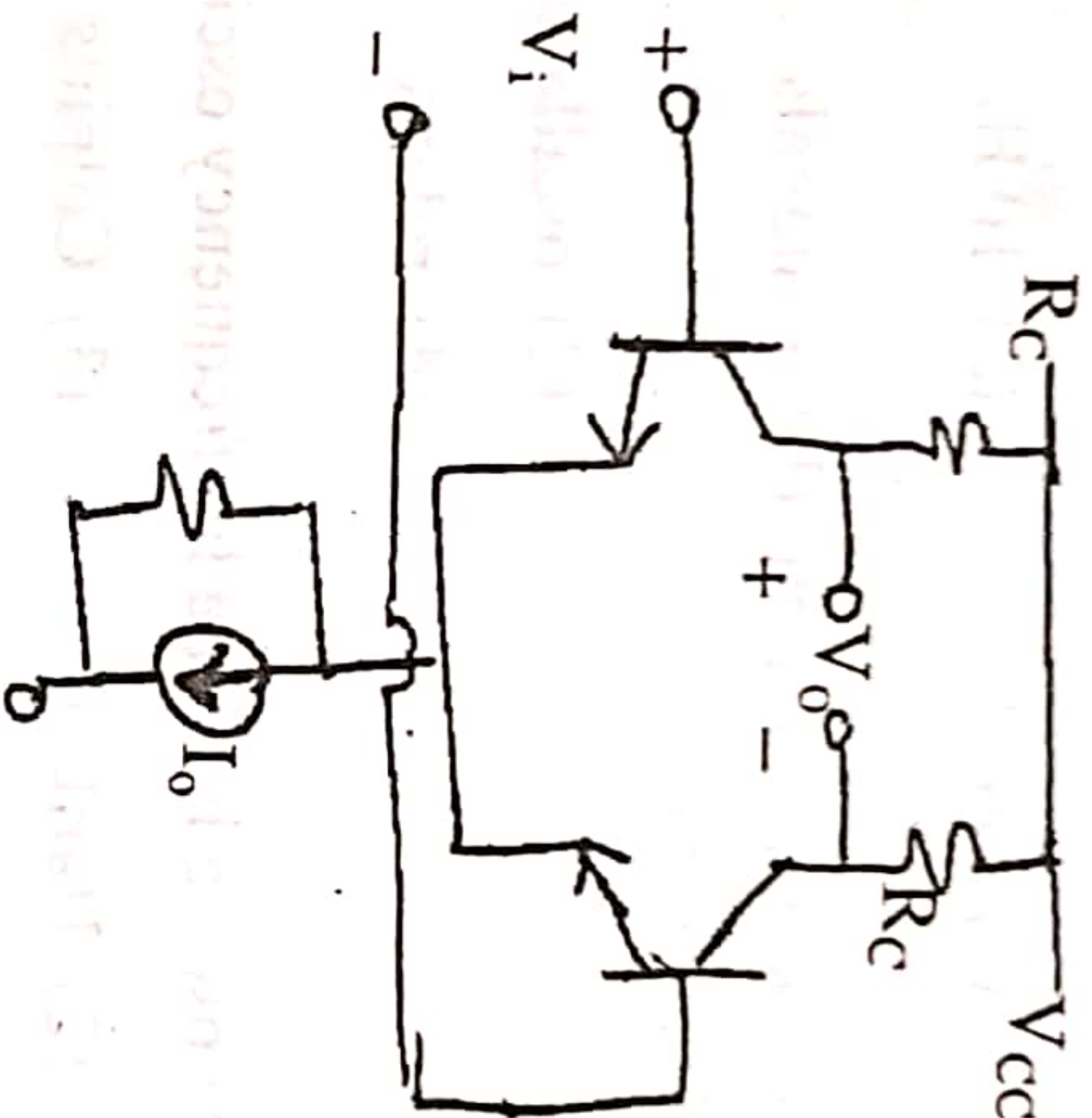

Fig. 4

(1) A_{cm} increases

(2) A_d increases

(3) Common-mode rejection ratio increases

(4) Common-mode rejection ratio decreases

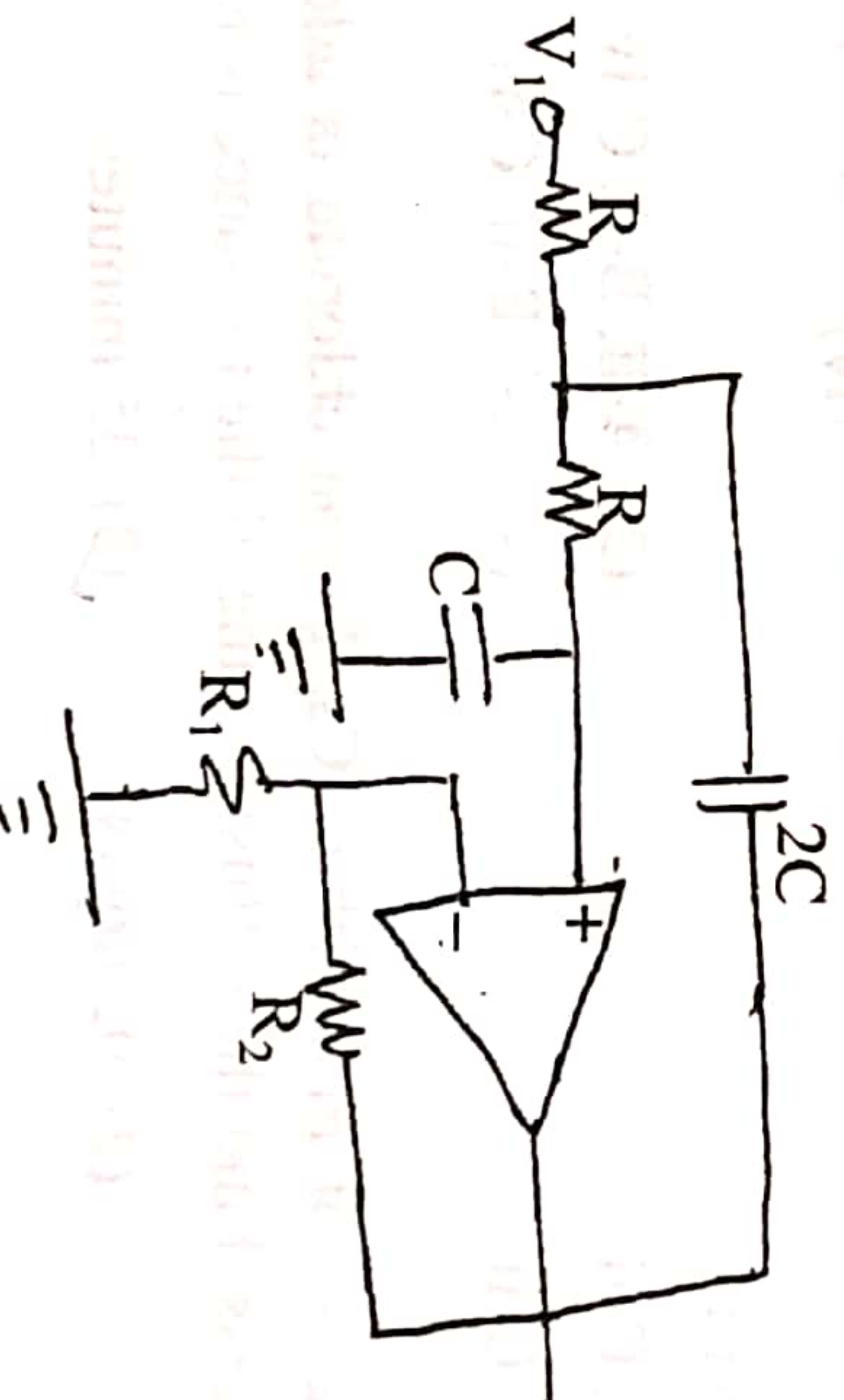56. Consider the following statements regarding the circuit as shown in Fig. 5

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(ii) The circuit represents a second order active filter.

(iii) The circuit has a cut-off rate of 40 dB has decade.

(1) (i), (ii) & (iii) are correct

(2) (i) & (ii) are correct

(3) Only (i) is correct

(4) (ii) & (iii) are correct

C

57. An op-amp has open loop gain of 10^5 and an open loop cut-off frequency of 10 Hz. If this op-amp is connected as an amplifier with a closed gain of 100, then the new upper cut-off frequency is :

   (1) 100 kHz   (2) 1000 kHz   (3) 10 Hz   (4) 10 kHz

58. .... converts Direct Current (DC) signals from the power supply units to Alternate Current (AC) signals.

   (1) micro controllers   (2) oscillators

   (3) transformers   (4) relays

59. Which one of the following is an audio frequency oscillator ?

   (1) Wein bridge   (2) Hartlay   (3) Colpitts   (4) Crystal

60. Match the following :

Group-I		Group-II	
(A)	Hartlay	(i)	Low frequency oscillator
(B)	Wein-Bridge	(ii)	High frequency oscillator
(C)	Crystal	(iii)	Relaxation oscillator
		(iv)	Stable frequency oscillator

   Correct answer is :

   (1) A-i, B-iii, C-ii   (2) A-ii, B-1, C-iv

   (3) A-iv, B-i, C-ii   (4) A-i, B-ii, C-iv

61. In the fabrication of monolithic ICs, Boron chloride is added as an impurity in the diffusion process. Find the diffusion time, if the furnance is heated upto 1200°C.

   (1) 01 hour   (2) 02 hours   (3) 35 minutes   (4) 20 minutes

62. How the aluminium film coating is carried out in metalization process ?

   (1) Heating and Pouring aluminium in required place

   (2) Placing the aluminium in required place and then heating it using tungsten

   (3) Aluminium is vaccum evaporated and then condensed

   (4) None of the mentioned

63. The burried layer reduces collector series resistance by providing :

(1) A low resistivity current path from n-type layer to n^+ contact layer

(2) A low resistivity current path from p-type layer to n^+ contact layer

(3) A high resistivity current path from n-type layer to n^+ contact layer

(4) A high resistivity current path from p-type layer to n^+ contact layer

64. The carrier density in the channel in the constant voltage model is scaled as :

(1) $1/\beta$

(2) 1

(3) β

(4) All of the mentioned

65. The parameter which is *not* <u>scaled to any factor is</u> :

(1) Power speed product

(2) Switching energy

(3) Channel resistance

(4) All of the mentioned

66. A digital CMOS IC operating at 15 MHz clock frequency consumes 130 mW, the same IC operating at 10 MHz clock frequency consumes 100 mW power. The static power consumption of the IC is :

(1) 20 mW

(2) 40 mW

(3) 50 mW

(4) 90 mW

67. What should be the width of metal 1 and metal 2 layers ?

(1) $3\lambda, 3\lambda$

(2) $2\lambda, 3\lambda$

(3) $2\lambda, 4\lambda$

(4) $3\lambda, 4\lambda$

68. .... are used in thick and thin film ICs, as individual components from outside.

(1) Transistors

(2) Active elements

(3) Diode

(4) All of the mentioned

69. Growth of SiO_2 on Si substrate can be achieved in two ways either using oxygen or using water vapour for growing thicker oxides ?

(1) dry oxidation can be used

(2) wet oxidations can be used

(3) any of dry & wet can be used

(4) dry oxidation followed by wet oxidation

70. If P is development, Q is etching, R is alignment & exposure and S is photoresist stripping then the order in which they are carried out in a standard photolithography process is :

(1) P-Q-R-S   (2) Q-P-S-R   (3) P-S-R-Q   (4) R-P-Q-S .

71. A network is said to be linear if and only if :

(1) the response is proportional to the excitation function

(2) the principle of superposition applies

(3) the principle of homogeneity applies

(4) both (2) and (3)

72. A battery charger can drive a current of 5 A into 1 Ω resistance connected at its output terminals. If it is able to charge an ideal 2 V battery at 7 A rate, then its Thevenin's equivalent will be :

(1) 7.5 V in series with 0.5 Ω

(2) 12.5 V in series with 1.5 Ω

(3) 7.5 V in parallel with 0.5 Ω

(4) 1.25 V in parallel with 1.5 Ω

73. In a given circuit as shown in Fig. 6, if the power dissipated in 6 Ω resistor is zero, the V is :

Fig. 6

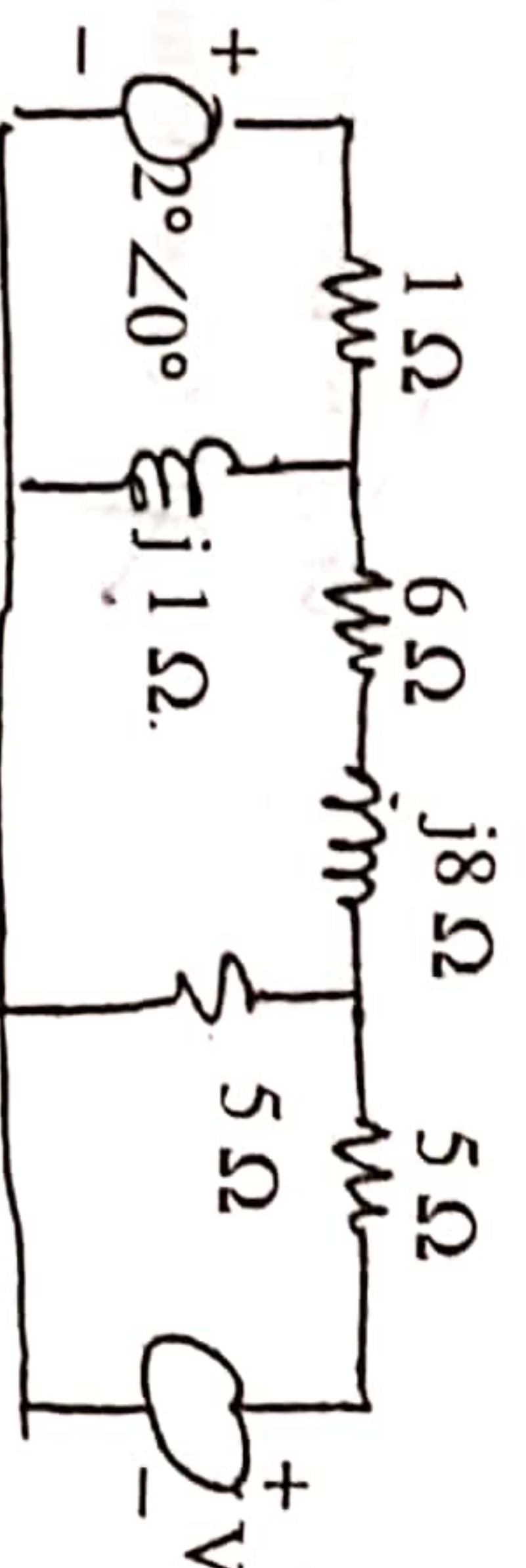(1) $20\sqrt{2} \angle 45°$ (2) $20 \angle 30°$ (3) $20 \angle 45°$ (4) $20\sqrt{2} \angle 30°$

C

74. Y parameters of a four terminal block are $\begin{bmatrix} 4 & 2 \\ 1 & 1 \end{bmatrix}$. A single element of 1 Ω is connected acoss as shown in Fig. 7. The new Y-parametes will be :
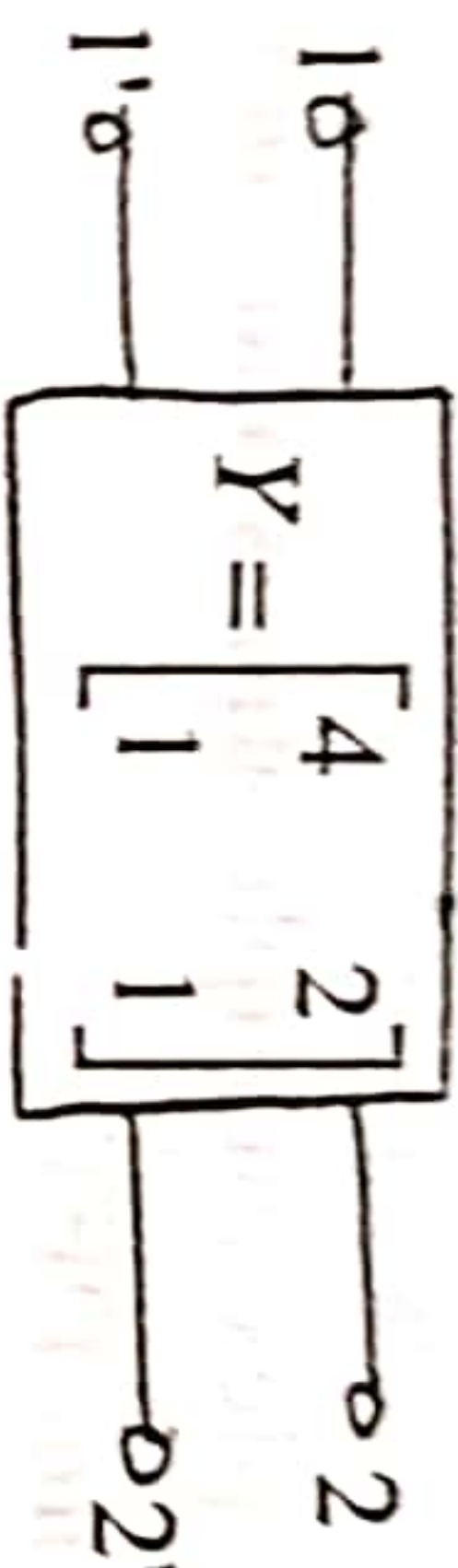
$$Y = \begin{bmatrix} 4 & 2 \\ 1 & 1 \end{bmatrix}$$

Fig. 7

(1) $\begin{bmatrix} 4 & 3 \\ 2 & 2 \end{bmatrix}$

(2) $\begin{bmatrix} 4 & 2 \\ 1 & 1 \end{bmatrix}$

(3) $\begin{bmatrix} 5 & 1 \\ 0 & 2 \end{bmatrix}$

(4) $\begin{bmatrix} 3 & 2 \\ 1 & 2 \end{bmatrix}$

75. In the given circuit as shown in Fig. 8, the switch was closed for a long time before opening at $t = 0$. The voltage v_x at $t = 0^+$ is :
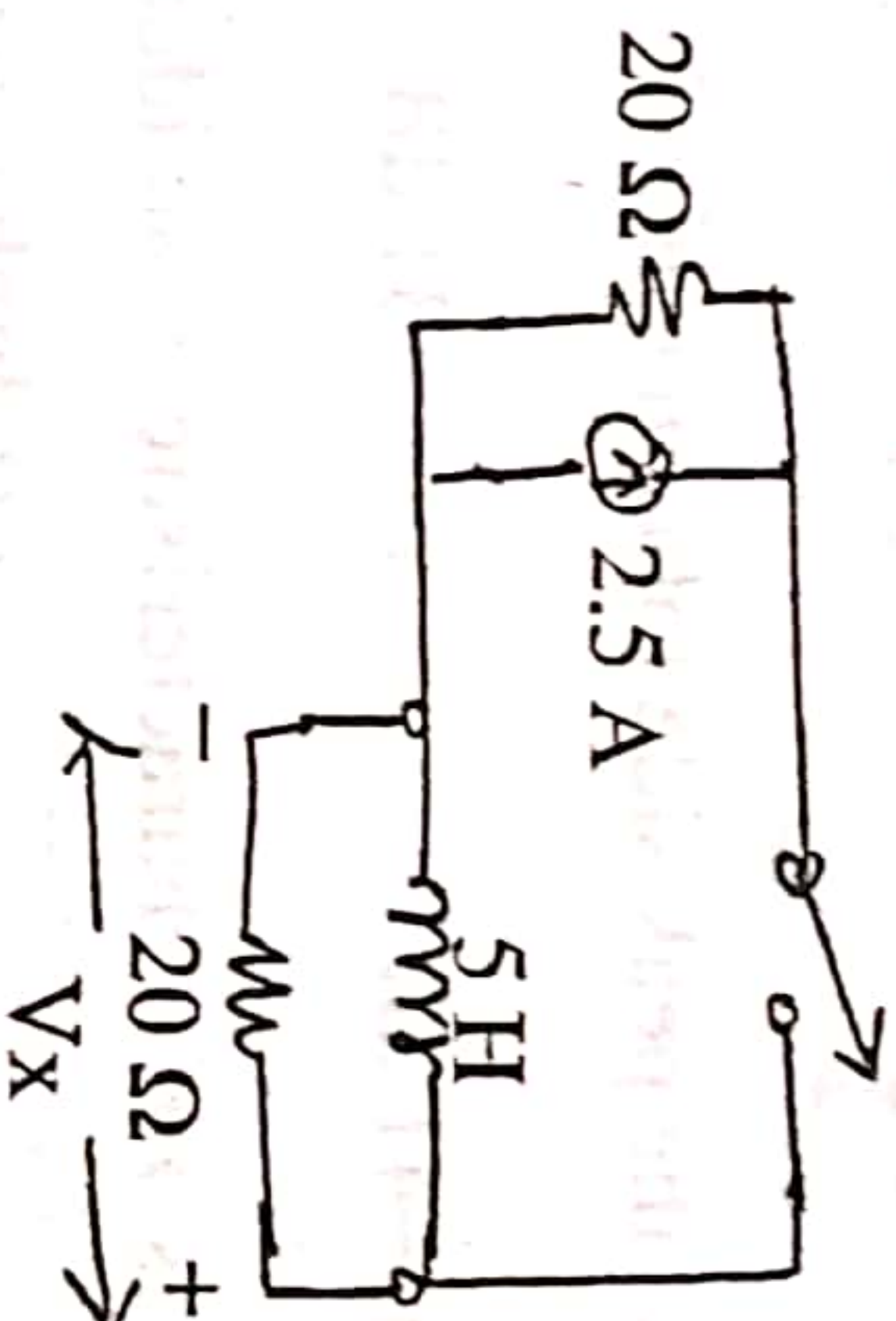
Fig. 8

(1) 25 V

(2) 50 V

(3) −50 V

(4) 0 V

76. What is the steady state current in 2 Ω resistor as shown Fig. 9 ? Internal resistance of the battery is negligible and value of the capacitance C is 0.2 μF :
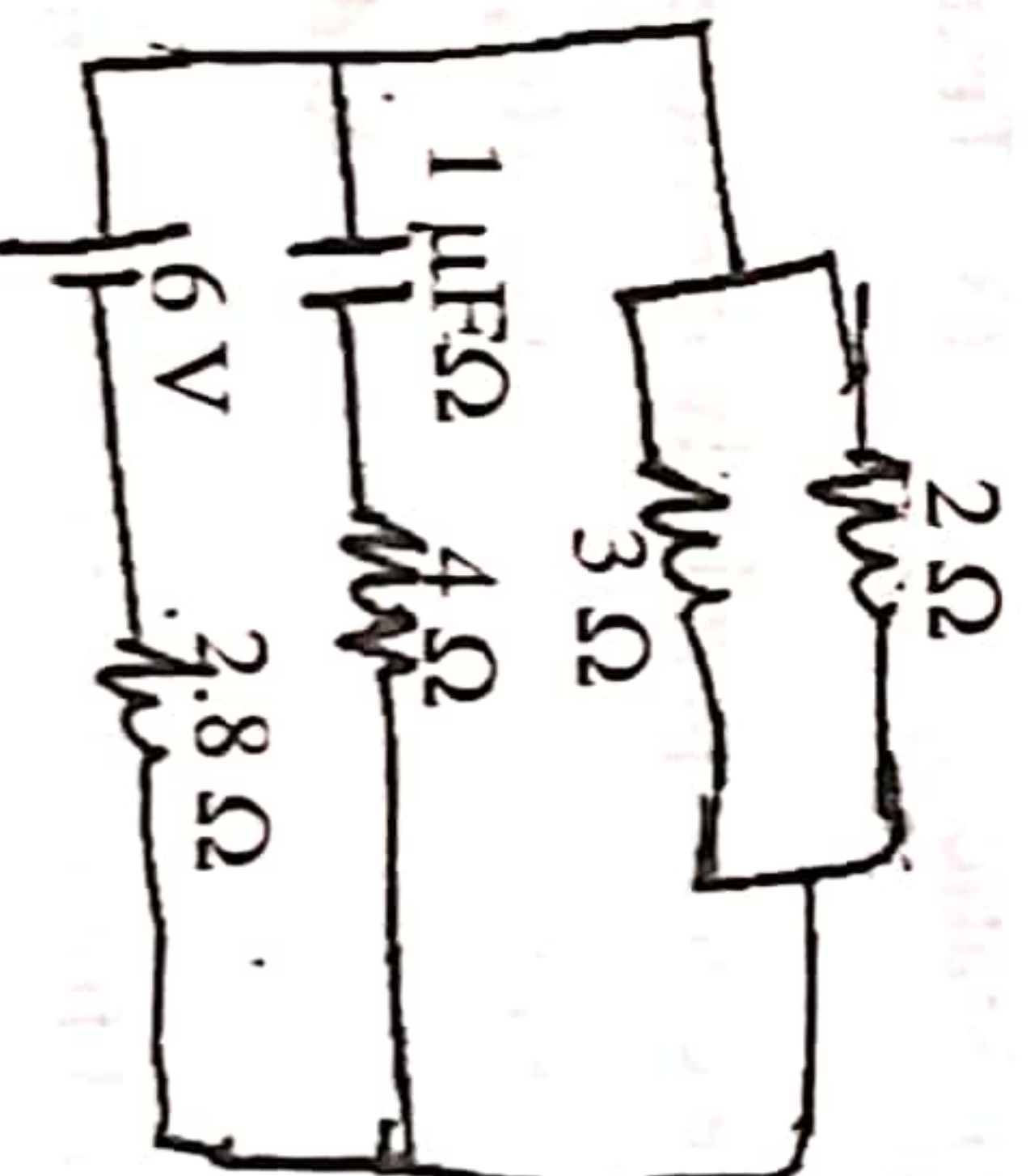
Fig. 9

(1) 1.5 A

(2) 1.2 A

(3) 0.6 A

(4) 0.9 A

16

77. Fourier Transform of $-a^n u(-n-1)$ is :

(1) $\dfrac{1}{1+ja\omega}$ (2) $\dfrac{1}{1-ja\omega}$ (3) $\dfrac{1}{1+ae^{-j\omega}}$ (4) $\dfrac{1}{1-ae^{j\omega}}$

78. The number of complex multiplications and complex additions involved in the direct computation of 8-point DFT :

(1) 64 & 56   (2) 8 & 16   (3) 64 & 64   (4) 64 & 8

79. Non-linearity in the relationship between Ω and ω is known as :

(1) aliasing   (2) frequency warping

(3) unwarping   (4) frequency mixing

80. For rectangular window, the peak side lobe magnitude in dB is :

(1) −58 dB   (2) −41 dB   (3) −31 dB   (4) − 13 dB

81. Which of the following is *not* a characteristic of an ideal transducer ?

(1) low noise   (2) high repeatability

(3) high dynamic range   (4) low linearity

82. The .... characteristics of transducer refer to the performance of the transducer when it is subject to time varying signal.

(1) Dynamic   (2) Static   (3) Transiant   (4) Both (1) and (2)

83. High Q coils inductance can be precisely measured by :

(1) Maxwells inductance bridge   (2) Hay's bridge

(3) Schering bridge   (4) Anderson's bridge

84. The device which is used for making temporary measurements of flow is :

(1) Venturi   (2) Dull flow tube

(3) Orfice plate   (4) Pitot static tube

85. The response $c(t)$ of a system is described by the differential equation

$$\frac{d^2}{dt^2}c(t) + 4\frac{d}{dt}c(t) + 5c(t) = 0.$$ The system response is :

(1) Undamped

(2) Under damped

(3) Critically damped

(4) Oscillatory

86. Consider the following amplifier with –ive feedback :
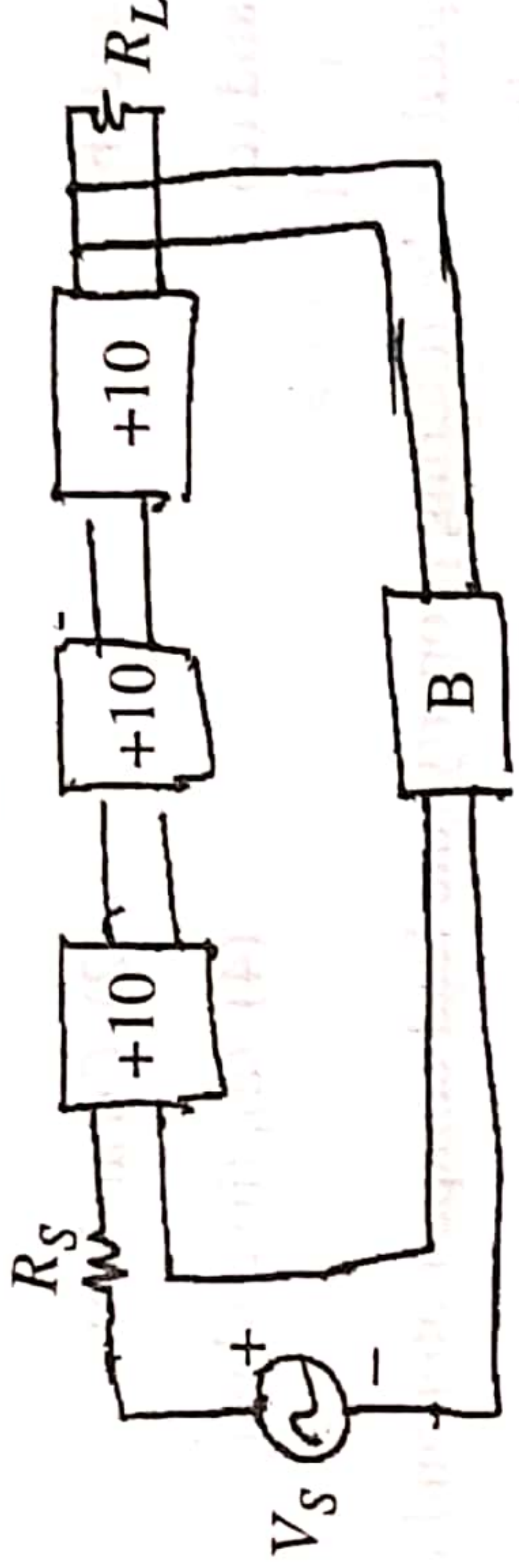
If the closed loop gain of the above amplifier is +100, the value of B will be :

(1) -11×10^3

(2) $+11 \times 10^3$

(3) -9×10^3

(4) $+9 \times 10^3$

87. A system has open loop transfer function $G(s) = \dfrac{10}{s(s+1)(s+3)}$, what is the steady state error when it is subjected to the input $r(t) = 10 + 2t + 3/2\,t^2$?

(1) 0.4

(2) 4

(3) infinity

(4) none of these

88. The given characteristics polynomial $s^4 + s^3 + 2s^2 + 2s + 3 = 0$ has :

(1) zero root in RHS in s-plane

(2) one root in RHS of s-plane

(3) two roots in RHS of s-plane

(4) three roots in RHS of s-plane

C

89. Consider the following statements :

In root-locus plot, the breakaway points

(a) need not always be on real axis alone

(b) must lie on root loci

(c) must lie on 0 and 1

Which of these statements are *correct* ?

(1) (a) and (b)

(2) (b) and (c)

(3) (a) and (c)

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

90. With regard to the filtering property, the lead compensator and the lag compensator are respectively :

(1) high pass and low pass filters

(2) low pass and high pass filters

(3) both low pass filters

(4) both high pass filters

91. When the memory or I/O device is not able to respond quickly, wait states (Tw) are inserted between .... by .... the READY input of the 8086.

(1) T_3 & T_4 disabling

(2) T_2 & T_3 disabling

(3) T_1 & T_2 enabling

(4) T_3 & T_4 enabling

92. AL, AX and DX registers of 8086 are used in following instructions :

(1) Multiply, Divide, I/O and Translate

(2) Multiply, Divide, I/O and Decimal adjustments

(3) Multiply, Divide, I/O, Translate and Decimal adjustments

(4) Multiply, Divide and I/O

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93. If [BX] = 1234 H, [BP] = 2490 H, AX = 1000 H, LIST = 5980 H, CS = 3000 H, DS = 2000 H, ES = 5000 H and SS = 6000 H. The effective and physical address of MOV LIST [BP], AX is given by :

(1) 8E10, 28E10   (2) 8E10, 68E10   (3) 7E10, 27E10   (4) 7E10, 67E10

94. If CF = 1, AX = 1F89H, what are the contents of AX and CF after the execution of following instructions ?

MOV CL, 2

RCL AX, CL

(1) AX = 2A6BH & CF = 1

(2) AX = 7EA6H & CF = 0

(3) AX = 7FB7H & CF = 0

(4) AX = 0F89H & CF = 1

95. Why is CHMOS technology preferred over HMOS technology for designing devices of MCS-51 family ?

(1) Due to higher noise immunity

(2) Due to lower power consumption

(3) Due to higher speed

(4) All of the above

96. Which is the only register without internal on-chip RAM address in MCS-51 ?

(1) Stack pointer

(2) Program counter

(3) Data printer

(4) Timer register

97. Which among the below mentioned functions does **not** belong to the category of alternate functions performed by Port-3 (Pins 10-17) ?

(1) Read/write control signals

(2) Serial ports

(3) Internal interrupts

(4) External interrupts

20

98. How many single byte, two byte and three byte instructions are supported by MCS-51 for overall instruction sent ?

(1) 45 single byte, 45 two bytes and 17 three bytes

(2) 45 single byte, 45 two bytes and 15 three bytes

(3) 55 single byte, 40 two bytes and 20 three bytes

(4) 40 single byte, 55 two bytes and 17 three bytes

99. Which rotate instructions has an ability to modify CY flag by moving the bit-7 & bit-0 respectively to accumulator ?

(1) RR & RL   (2) RRC & RLC   (3) RR & RLC   (4) RL & RLC

100. Which instructions affect the program counter ?

(1) CALL & RETURN   (2) RETURN & JUMP

(3) PUSH & POP   (4) CALL & JUMP

D

SET-X

PHD-EE-2023-24
Electrical & Communication Engineering

Sr. No. 10004

Time : 1¼ Hours   Max. Marks : 100   Total Questions : 100

Roll No. (in figures) 9380404   (in words) _____

Name _Palkit_   Date of Birth 15-1-93

Father's Name _Ramesh_   Mother's Name _____

Date of Examination 25-03-24

_____   _____
(Signature of the Candidate)   (Signature of the Invigilator)

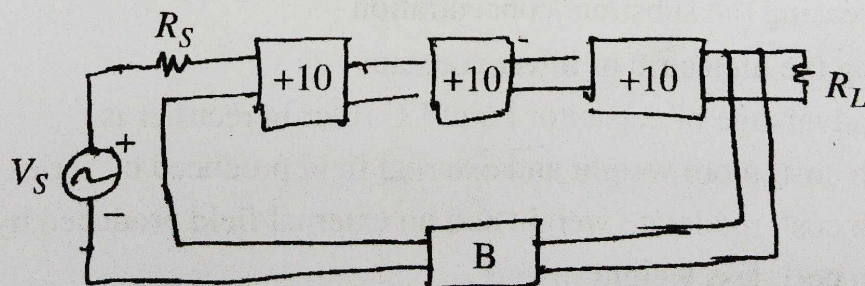## CANDIDATES MUST READ THE FOLLOWING INFORMATION/INSTRUCTIONS BEFORE STARTING THE QUESTION PAPER.

1. *All questions are compulsory.*

2. The candidates *must return* the question booklet as well as OMR Answer-Sheet to the Invigilator concerned before leaving the Examination Hall, failing which a case of use of unfair-means / mis-behaviour will be registered against him / her, in addition to lodging of an FIR with the police. Further the answer-sheet of such a candidate will not be evaluated.

3. Keeping in view the transparency of the examination system, carbonless OMR Sheet is provided to the candidate so that a copy of OMR Sheet may be kept by the candidate.

4. Question Booklet along with answer key of all the A, B, C & D code shall be got uploaded on the University Website immediately after the conduct of Entrance Examination. Candidates may raise valid objection/complaint if any, with regard to discrepancy in the question booklet/answer key within 24 hours of uploading the same on the University Website. The complaint be sent by the students to the Controller of Examinations by hand or through email. Thereafter, no complaint in any case, will be considered.

5. The candidate *must not* do any rough work or writing in the OMR Answer-Sheet. Rough work, if any, may be done in the question booklet itself. Answers *must not* be ticked in the question booklet.

6. *There will be no negative marking. Each correct answer will be awarded one full mark. Cutting, erasing, overwriting and more than one answer in OMR Answer-Sheet will be treated as incorrect answer.*

7. Use only **Black** or **Blue Ball Point Pen** of good quality in the OMR Answer-Sheet.

8. *Before answering the questions, the candidates should ensure that they have been supplied correct and complete booklet. Complaints, if any, regarding misprinting etc. will not be entertained 30 minutes after starting of the examination.*

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1. Which of the following is **not** a characteristic of an ideal transducer ?
   (1) low noise
   (2) high repeatability
   (3) high dynamic range
   (4) low linearity

2. The .... characteristics of transducer refer to the performance of the transducer when it is subject to time varying signal.
   (1) Dynamic
   (2) Static
   (3) Transiant
   (4) Both (1) and (2)

3. High Q coils inductance can be precisely measured by :
   (1) Maxwells inductance bridge
   (2) Hay's bridge
   (3) Schering bridge
   (4) Anderson's bridge

4. The device which is used for making temporary measurements of flow is :
   (1) Venturi
   (2) Dull flow tube
   (3) Orfice plate
   (4) Pitot static tube

5. The response $c(t)$ of a system is described by the differential equation $\dfrac{d^2}{dt^2}c(t) + 4\dfrac{d}{dt}c(t) + 5c(t) = 0$. The system response is :
   (1) Undamped
   (2) Under damped
   (3) Critically damped
   (4) Oscillatory

   $x^2 + 4x + 5$
   $1 \quad 5$
   $4 \quad 0$
   $5 \quad 0$

6. Consider the following amplifier with −ive feedback :

   If the closed loop gain of the above amplifier is +100, the value of B will be :

   $\dfrac{A_{open}}{1+A\beta}$

   $10 = 1 + A\beta$

   9

   (1) -11×10^3
   (2) $+11 \times 10^3$
   (3) -9×10^3
   (4) $+9 \times 10^3$

7. A system has open loop transfer function $G(s) = \dfrac{10^\circ}{s(s+1)(s+3)}$, what is the steady state error when it is subjected to the input $r(t) = 10 + 2t + 3/2^{t^2}$?

(1) 0.4
(2) 4
(3) infinity
(4) none of these

8. The given characteristics polynomial $s^4 + s^3 + 2s^2 + 2s + 3 = 0$ has :

(1) zero root in RHS in s-plane
(2) one root in RHS of s-plane
(3) two roots in RHS of s-plane
(4) three roots in RHS of s-plane

9. Consider the following statements :

In root-locus plot, the breakaway points

(a) need not always be on real axis alone

(b) must lie on root loci

(c) must lie on 0 and 1

Which of these statements are *correct* ?

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

10. With regard to the filtering property, the lead compensator and the lag compensator are respectively :

(1) high pass and low pass filters
(2) low pass and high pass filters
(3) both low pass filters
(4) both high pass filters

11. In a MOSFET the threshold voltage can be lowered by :

(1) increasing the gate oxide thickness
(2) reducing the substrate concentration
(3) increasing the substrate concentration
(4) using the dielectric of lower constant

12. The disadvantage of capacitor input LC filter in rectifier is :

(1) high cost, more weight and external field produced by series inductor
(2) high cost, moderate weight and no external field produced by series inductor
(3) high cost, less weight
(4) low cost, more weight

13. Which of the following architecture can be designed as an instrumentation amplifier ?

(1) Indirect current feedback
(2) Direct current feedback
(3) Indirect voltage feedback
(4) Direct voltage feedback

D

14. The circuit as shown in Fig. 3, $V_O = V_{OA}$ for switch SW in position A and $V_O = V_{OB}$ for switch SW in position B. Assume that op amp is ideal. The value of $\dfrac{V_{OB}}{V_{OA}}$ is :
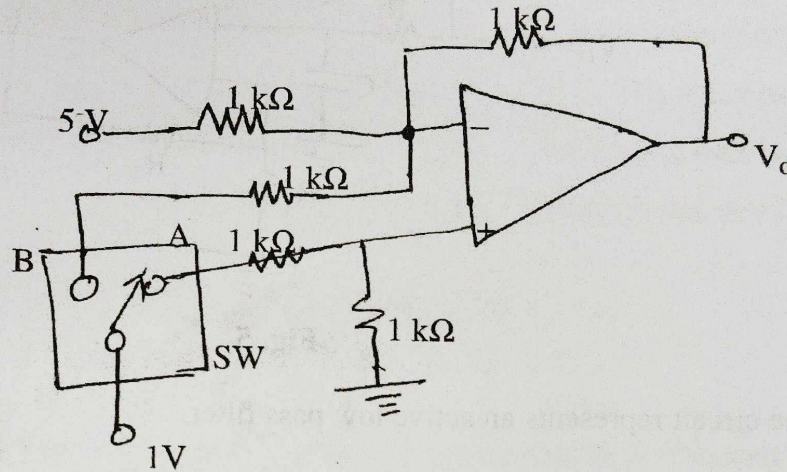

(handwritten, top right) $\dfrac{V_{OB}}{V_{OA}} = k = \dfrac{V_{OB}}{3}$

Fig. 3

(1) 3   (2) 0.5   (3) 2   (4) 1.5

15. In the differential amplifier as shown in Fig. 4, the magnitude of the common-mode and diferential-mode gains are A_{cm} and A_d, respectively. If the resistance R_E is increased, then :

(handwritten) $R_E \uparrow$
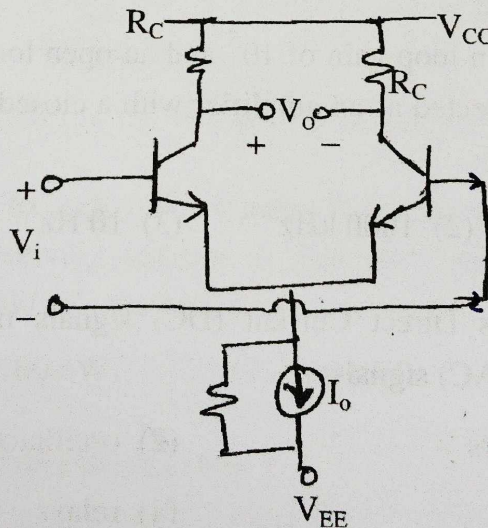
$I_0 + V_0 = R$

$V = IR$

$= R_C = 2/3$

Fig. 4

(1) A_{cm} increases
(2) A_d increases
(3) Common-mode rejection ratio increases
(4) Common-mode rejection ratio decreases

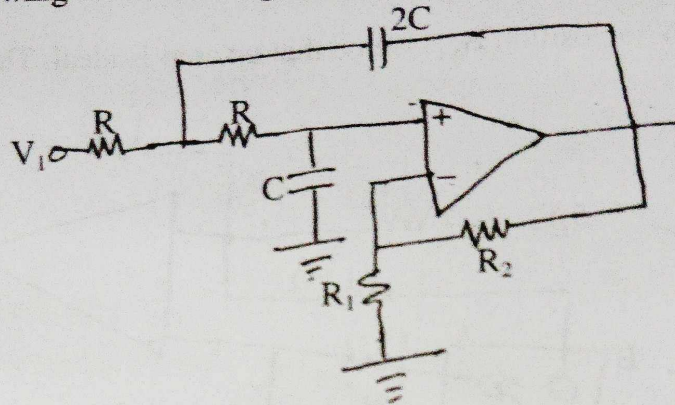16. Consider the following statements regarding the circuit as shown in Fig. 5

Fig. 5

(i) The circuit represents an active low pass filter.

(ii) The circuit represents a second order active filter.

(iii) The circuit has a cut-off rate of 40 dB has decade.

(1) (i), (ii) & (iii) are correct   (2) (i) & (ii) are correct

(3) Only (i) is correct   (4) (ii) & (iii) are correct

17. An op-amp has open loop gain of 10^5 and an open loop cut-off frequency of 10 Hz. If this op-amp is connected as an amplifier with a closed gain of 100, then the new upper cut-off frequency is :

(1) 100 kHz   (2) 1000 kHz   (3) 10 Hz   (4) 10 kHz

18. .... converts Direct Current (DC) signals from the power supply units to Alternate Current (AC) signals.   DC AC

(1) micro controllers   (2) oscillators

(3) transformers   (4) relays

19. Which one of the following is an audio frequency oscillator ?

(1) Wein bridge   (2) Hartlay   (3) Colpitts   (4) Crystal

20. Match the following :

	Group-I			Group-II
(A)	Hartlay		(i)	Low frequency oscillator
(B)	Wein-Bridge		(ii)	High frequency oscillator
(C)	Crystal		(iii)	Relaxation oscillator
			(iv)	Stable frequency oscillator

Correct answer is :

(1) A-i, B-iii, C-ii

(2) A-ii, B-1, C-iv

(3) A-iv, B-i, C-ii

(4) A-i, B-ii, C-iv

21. Which one of the following sets of equations is independent of Maxwell's equations ?

(1) Two curl equations

(2) Two divergence equations

(3) Both curl and divergence equations

(4) Two curl equations combined with continuity equation

22. The lowest frequency at which a uniform plane wave incident from region 1 onto the boundary at $z = 0$ will have no reflection is :

(1) 45°   (2) 30°   (3) 90°   (4) 60°

23. A receiving antenna is located 100 m away from the transmitting antenna. If the effective area of the receiving antenna is 500 cm^2 and the power density at the receiving location is 2 mW/m^2, the total power received is :

(1) 10 µW   (2) 100 nW   (3) 100 µW   (4) 10 nW

24. Which of these is *not* true of a lossless line ?

(1) $Z_{in} = -j\, Z_0$ for a shorted line with $l = \lambda/8$

(2) $Z_{in} = Z_0$ for a mached line

(3) $Z_{in} = j\, \infty$ for a shorted line with $l = \lambda/4$

(4) All of the above

25. Which of the following potentials does *not* satisfy Laplace's equation ?

    (1) $V = 2x + 5$

    (2) $V = \rho \cos \phi + 10$

    (3) $V = r \cos \phi$

    (4) $V = \dfrac{10}{}$.

26. By saying that the electrostatic field is conservative, we do *not* mean that :

    (1) It is the gradient of a scalar potential

    (2) Its circulation is identically zero

    (3) Its curl is identically zero

    (4) The potential difference between any point is zero

27. A zero mean white Gaussian noise is passed through an ideal low pass filter of bandwidth 10 kHz. The output of the samples so obtained would be :

    (1) Correlated

    (2) Statistically independent

    (3) Incorrelated

    (4) Orthogonal

28. If in a broadcasting studio, a 1000 kHz carrier is modulated by an audio signal of frequency range 100-5000 kHz, the width of channel is :

    (1) 5 kHz   (2) 4.9 kHz   (3) 995 kHz   (4) 10 kHz

29. The bit rate of the digital communication system is MKBPS. The modulation used is 16 QAM. The minimum bandwidth required for ideal transmission is :

    (1) M/2 kHz   (2) M/16 kHz   (3) MHz   (4) M/8 kHz

30. The noise performance of a square low demodulator of AM signal is :

    (1) better than that of an envelope detector

    (2) better than that of a synchronous detector

    (3) identical than that of a synchronous detector

    (4) poorer than that of envelope detector

31. Fermi level for intrinsic semiconductor lies :

(1) At middle of the band gap

(2) Close to conduction band

(3) Close to valence band

(4) None

32. Consider the transistor shown in Fig. 1 :

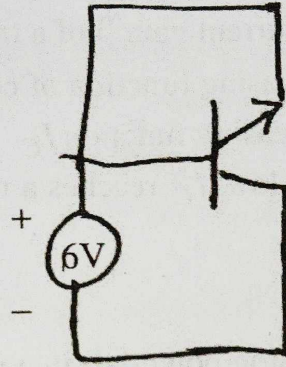**Fig. 1**

The transistor is operating in :

(1) Forward-Active region

(2) Reverse-Active region

(3) Saturation region

(4) Cut off region

33. The electron concentration in silicon decreases linearly from 10^{16} cm^{-3} to 10^{15} cm^{-3} over a distance of 0.10 cm. The cross-sectional area of sample is 0.05 cm^2. The electron diffusion coefficient, D_n is given by 25 cm^2/sec. The diffusion current in silicon will be :

(1) 0.36 mA

(2) 3.6 mA

(3) 0.18 mA

(4) 18 mA

34. A silicon p$^+$n junction has doping concentration of $N_a = 10^{18}$ cm^{-3} and $N_d = 5 \times 10^{15}$ cm^{-3}. The cross-sectional area of the junction is $A = 5 \times 10^{-5}$ cm^2, what will be the capacitance for the applied reverse voltage, $V_R = 3$ V ?

(1) 0.521 pF

(2) 0.005 nF

(3) 1.04 nF

(4) 2.61 nF

35. Consider on MOS structure with p-type silicon and $N_a = 6 \times 10^{15}$ cm^{-3}. If the gate is aluminium then the metal semiconductor work function difference, ϕ_{ms} of the MOS structure will be :

(1) −2.256 V

(2) −0.944 V

(3) 7.344 V

(4) 4.144 V

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P. T. O.

36. The phenomenon known as "Early Effect" in a bipolar transistor refers to a reduction of base-width caused by :

(1) Electron-hole recombination base

(2) The forward biasing of emitter-base junction

(3) The early removal of stored base charge during saturation to cut-off region

(4) The reverse biasing of base-collector junction

37. The common short circuit current gain β of a transistor :

(1) is a monotonically increasing function of collector current I_C

(2) is a monotonically decreasing function I_C

(3) increasing with I_C, for low I_C reaches a maximum and then decrease with further increase in I_C

(4) is not a function of I_C

38. The built-in-potential (diffusion potential) in a pn-junction :

(i) increases with increase in temperature

(ii) increases with increase in doping in the dioping levels of two sides

(iii) is equal to the average of the Fermi levels of two sides

(iv) is equal to the difference of the Fermi levels of two sides

Which of the following statement is *correct* ?

(1) (i), (ii) & (iv)   (2) (i) & (ii)   (3) (ii) & (iii)   (4) (i) & (iv)

39. The current gain of the transistor as shown in Fig. 2 is $\beta = 125$. The Q-point values (I_{CQ} & V_{CEQ}) are :
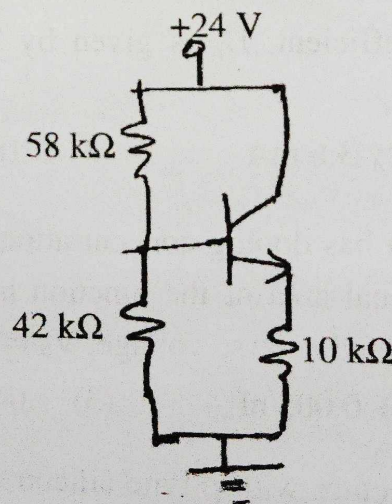
+24 V

58 kΩ

42 kΩ

10 kΩ

Fig. 2

(1) 0.418 mA & 20.4 V

(3) 0.913 mA & 14.8 V

(2) 0.913 mA & 16.23 V

(4) 0.418 mA & 18.43 mV

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40. The collector to emitter cut-off current (I_{CEO}) to base cut-off current (I_{CBO}) is .... as α is the CB current gain of transistor :

(1) $I_{CEO} = I_{CBO}$

(2) $I_{CEO} = \alpha\, I_{CBO}$

(3) $I_{CEO} = \dfrac{I_{CBO}}{1+\alpha}$

(4) $I_{CEO} = \dfrac{I_{CBO}}{1-\alpha}$

41. When the memory or I/O device is not able to respond quickly, wait states (Tw) are inserted between .... by .... the READY input of the 8086.

(1) T_3 & T_4 disabling

(2) T_2 & T_3 disabling

(3) T_1 & T_2 enabling

(4) T_3 & T_4 enabling

42. AL, AX and DX registers of 8086 are used in following instructions :

(1) Multiply, Divide, I/O and Translate

(2) Multiply, Divide, I/O and Decimal adjustments

(3) Multiply, Divide, I/O, Translate and Decimal adjustments

(4) Multiply, Divide and I/O

43. If [BX] = 1234 H, [BP] = 2490 H, AX = 1000 H, LIST = 5980 H, CS = 3000 H, DS = 2000 H, ES = 5000 H and SS = 6000 H. The effective and physical address of MOV LIST [BP], AX is given by :

(1) 8E10, 28E10

(2) 8E10, 68E10

(3) 7E10, 27E10

(4) 7E10, 67E10

44. If CF = 1, AX = 1F89H, what are the contents of AX and CF after the execution of following instructions ?

MOV CL, 2

RCL AX, CL

(1) AX = 2A6BH & CF = 1

(2) AX = 7EA6H & CF = 0

(3) AX = 7FB7H & CF = 0

(4) AX = 0F89H & CF = 1

P. T. O.

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45. Why is CHMOS technology preferred over HMOS technology for designing devices of MCS-51 family ?

(1) Due to higher noise immunity

(2) Due to lower power consumption

(3) Due to higher speed

(4) All of the above

46. Which is the only register without internal on-chip RAM address in MCS-51 ?

(1) Stack pointer

(2) Program counter

(3) Data printer

(4) Timer register

47. Which among the below mentioned functions does *not* belong to the category of alternate functions performed by Port-3 (Pins 10-17) ?

(1) Read/write control signals

(2) Serial ports

(3) Internal interrupts

(4) External interrupts

48. How many single byte, two byte and three byte instructions are supported by MCS-51 for overall instruction sent ?

(1) 45 single byte, 45 two bytes and 17 three bytes

(2) 45 single byte, 45 two bytes and 15 three bytes

(3) 55 single byte, 40 two bytes and 20 three bytes

(4) 40 single byte, 55 two bytes and 17 three bytes

49. Which rotate instructions has an ability to modify CY flag by moving the bit-7 & bit-0 respectively to accumulator ?

(1) RR & RL   (2) RRC & RLC   (3) RR & RLC   (4) RL & RLC

50. Which instructions affect the program counter ?

(1) CALL & RETURN

(2) RETURN & JUMP

(3) PUSH & POP

(4) CALL & JUMP

51. If carrier modulated by a digital bit stream has one of the possible phases of $0°$, $90°$, $180°$ and $270°$, then the modulation is called :

(1) BPSK   (2) QPSK   (3) QAM   (4) MSK

52. A signal having uniformly distributed amplitude in the interval $(-V, +V)$ is to be encoded using PCM with uniform quantization. The signal to quantization noise is determined by the :

(1) number of quantizing levels

(2) sampling rate

(3) dynamic range to the signal

(4) power spectrum of signal

53. In asynchronous TDM, for n signal sources, each frame contains m slots, where m is usually :

(1) $2n$

(2) greater than $2n$

(3) n

(4) less than n

54. An optical fiber behaves as a birefringence medium due to differences in :

(1) Effective R-I and core geometry

(2) Core-cladding symmetry

(3) Transmission/propagation time of waves

(4) Refractive indices of glass & silica

55. A single node fiber has mode field diameter 10.2 μm and $V = 2.20$. What is the core diameter of this fiber ?

(1) 11.1 μm   (2) 13.2 μm   (3) 7.6 μm   (4) 10.1 μm

D

56. A multimode step index fiber has source of RMS spectral width of 60 nm and dispersion parameter for fiber is 150 psn m^{-1}km^{-1}. Estimate rms pulse broadening due to material dispersion :

(1) 12.5 ns km^{-1} (2) 9.6 ns km^{-1} (3) 9.0 ns km^{-1} (4) 10.2 ns km^{-1}

57. A compared to planar LED structure, Dome LEDs have .... external power efficiency .... effective emission area and .... radiance.

(1) greater, lesser, reduced   (2) higher, greater, reduced

(3) higher, lesser, increased   (4) greater, greater, increased

58. The wavelength of RAPD with 70% efficiency and responsibility 0.689 A/W is given by :

(1) 06 μm   (2) 7.21 μm   (3) 0.112 μm   (4) 03 μm

59. An RC Snubber circuit is used to protect a thysistor against :

(1) false triggering   (2) failure to turn on

(3) switching transiants   (4) failure to commutate

60. What is the backup duration for 600 VA UPS ?

(1) 30 to 45 minutes   (2) 15 to 20 minutes

(3) 01 to 05 minutes   (4) 05 to 10 minutes

61. A network is said to be linear if and only if :

(1) the response is proportional to the excitation function

(2) the principle of superposition applies

(3) the principle of homogeneity applies

(4) both (2) and (3)

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62. A battery charger can drive a current of 5 A into 1 Ω resistance connected at its output terminals. If it is able to charge an ideal 2 V battery at 7 A rate, then its Thevenin's equivalent will be :

(1) 7.5 V in series with 0.5 Ω

(2) 12.5 V in series with 1.5 Ω

(3) 7.5 V in parallel with 0.5 Ω

(4) 1.25 V in parallel with 1.5 Ω

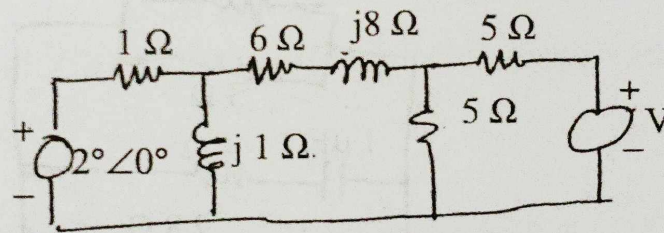**63.** In a given circuit as shown in Fig. 6, if the power dissipated in 6 Ω resistor is zero, the V is :

Fig. 6

(1) $20\sqrt{2} \angle 45°$ (2) $20 \angle 30°$ (3) $20 \angle 45°$ (4) $20\sqrt{2} \angle 30°$

64. Y parameters of a four terminal block are $\begin{bmatrix} 4 & 2 \\ 1 & 1 \end{bmatrix}$. A single element of 1 Ω is connected acoss as shown in Fig. 7. The new Y-parametes will be :
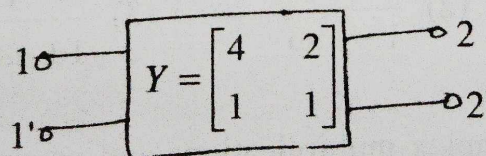

Fig. 7

(1) $\begin{bmatrix} 4 & 3 \\ 2 & 2 \end{bmatrix}$ (2) $\begin{bmatrix} 4 & 2 \\ 1 & 1 \end{bmatrix}$ (3) $\begin{bmatrix} 5 & 1 \\ 0 & 2 \end{bmatrix}$ (4) $\begin{bmatrix} 3 & 2 \\ 1 & 2 \end{bmatrix}$

65. In the given circuit as shown in Fig. 8, the switch was closed for a long time before opening at t = 0. The voltage v_x at t = 0^+ is :
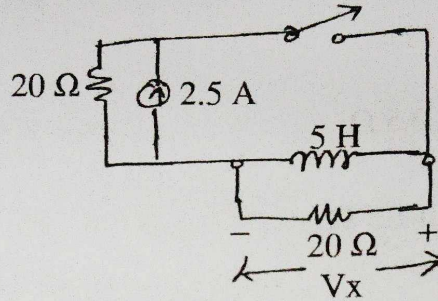
Fig. 8

(1) 25 V   (2) 50 V   (3) −50 V   (4) 0 V

66. What is the steady state current in 2 Ω resistor as shown Fig. 9 ? Internal resistance of the battery is negligible and value of the capacitance C is 0.2 µF :
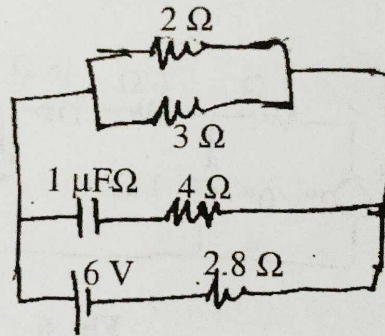
Fig. 9

(1) 1.5 A   (2) 1.2 A   (3) 0.6 A   (4) 0.9 A

67. Fourier Transform of $-a^n u(-n-1)$ is :

(1) $\dfrac{1}{1+ja\omega}$ (2) $\dfrac{1}{1-ja\omega}$ (3) $\dfrac{1}{1+ae^{-j\omega}}$ (4) $\dfrac{1}{1-ae^{j\omega}}$

68. The number of complex multiplications and complex additions involved in the direct computation of δ-point DFT :

(1) 64 & 56   (2) 8 & 16   (3) 64 & 64   (4) 64 & 8

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69. Non-linearity in the relationship between Ω and ω is known as :

    (1) aliasing

    (2) frequency warping

    (3) unwarping

    (4) frequency mixing

70. For rectangular window, the peak side lobe magnitude in dB is :

    (1) −58 dB   (2) −41 dB   (3) −31 dB   (4) − 13 dB

71. The abrupt truncation of Fourier series results in oscillations in :

    (1) both pass band & stop band

    (2) only pass band

    (3) only stop band

    (4) none of these

72. The trigonometric Fourier series representation of a function with half wave symmetry consists of :

    (1) even hormonics

    (2) old hormonics

    (3) sine terms only

    (4) cosine terms only

73. The circuit as shown in Fig. 10 converts a binary code Y_1 Y_2 Y_3 into :
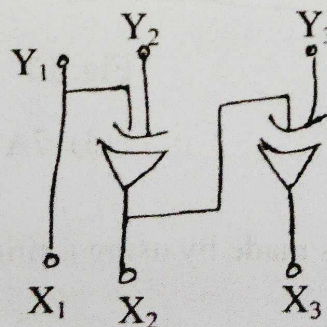
Fig. 10

    (1) Hamming code

    (2) BCD code

    (3) Gray code

    (4) Excess 3-code

74. The circuit in Fig. 11 produces the output sequence :
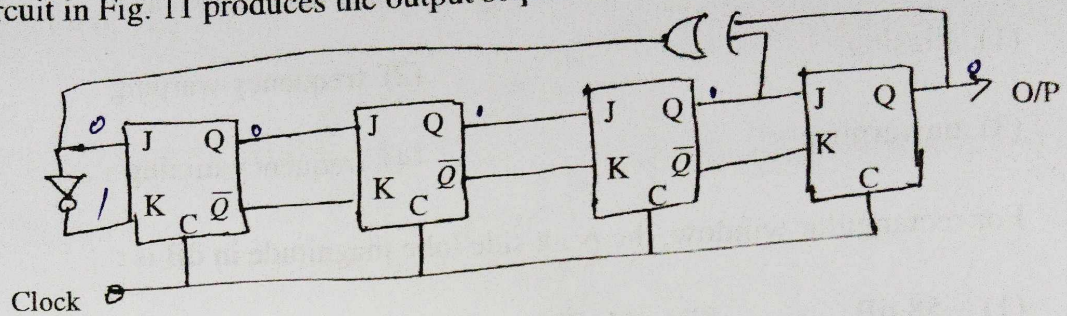
Fig. 11

(1) 1111   1111   0000   0000

(2) 1111   0000   1111   0000

(3) 1111   0001   0011   0100

(4) 1010   1010   1010   1010

75. If initially register contains byte B7H, then after 04 clock pulses, the contents of register will be shown in Fig. 12 :
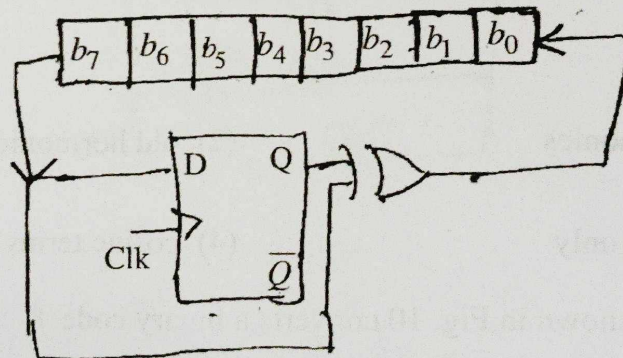
Fig. 12

(1) 7C   (2) 7E   (3) 7A   (4) 74

76. A switch-tail ring counter is made by using a single D-FF. The resulting circuit is :

(1) SR Flip-flop   (2) JK Flip-flop

(3) D-FF   (4) T-FF

77. A pulse train can be delayed by a finite number periods usings of clock :

(1) a seriel-in-serial shift register

(2) a serial-in-parallel-out shift register

(3) a parallel-in-serial-out shift register

(4) a serial-in-parallel-out shift register

78. Dual slope integration type analog to digital converters provide :

(1) higher speeds compared to all other types of A/D conveters

(2) poor rejection of power supply hum

(3) better resolution compared to all other types of A/D converters for the same number of bits
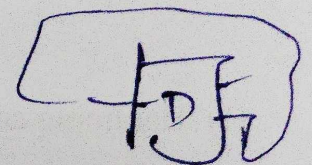
(4) very good accuracy without putting extreme requirements on component stability

79. In a 4-bit weighted resistor D/A converter, the resister value corresponding to MSB will be :

(1) 4 kΩ (2) 8 kΩ (3) 16 kΩ (4) 32 kΩ

80. An 8-bit digital ramp ADC with a 40 mV resolution uses a clock frequency of 2.5 MHz and a comparator with $V_T = 1$ mV. The digital output for $V_A = 6.000$ V is :

(1) 1011111   (2) 1011110   (3) 10010111   (4) 10010110

81. In the fabrication of monolithic ICs, Boron chloride is added as an impurity in the diffusion process. Find the diffusion time, if the furnance is heated upto 1200°C.

(1) 01 hour   (2) 02 hours   (3) 35 minutes   (4) 20 minutes

82. How the aluminium film coating is carried out in metalization process ?

(1) Heating and Pouring aluminium in required place

(2) Placing the aluminium in required place and then heating it using tungsten

(3) Aluminium is vaccum evaporated and then condensed

(4) None of the mentioned

83. The burried layer reduces collector series resistance by providing :

(1) A low resistivity current path from n-type layer to n^+ contact layer

(2) A low resistivity current path from p-type layer to n^+ contact layer

(3) A high resistivity current path from n-type layer to n^+ contact layer

(4) A high resistivity current path from p-type layer to n^+ contact layer

84. The carrier density in the channel in the constant voltage model is scaled as :

(1) $1/\beta$

(2) 1

(3) β

(4) All of the mentioned

85. The parameter which is *not* scaled to any factor is :

(1) Power speed product

(2) Switching energy

(3) Channel resistance

(4) All of the mentioned

86. A digital CMOS IC operating at 15 MHz clock frequency consumes 130 mW, the same IC operating at 10 MHz clock frequency consumes 100 mW power. The static power consumption of the IC is :

(1) 20 mW

(2) 40 mW

(3) 50 mW

(4) 90 mW

87. What should be the width of metal 1 and metal 2 layers ?

(1) $3\lambda, 3\lambda$

(2) $2\lambda, 3\lambda$

(3) $2\lambda, 4\lambda$

(4) $3\lambda, 4\lambda$

88. …………….. are used in thick and thin film ICs, as individual components from outside.

(1) Transistors

(2) Active elements

(3) Diode

(4) All of the mentioned

89. Growth of SiO_2 on Si substrate can be achieved in two ways either using oxygen or using water vapour for growing thicker oxides ?

(1) dry oxidation can be used

(2) wet oxidations can be used

(3) any of dry & wet can be used

(4) dry oxidation followed by wet oxidation

90. If P is development, Q is etching, R is alignment & exposure and S is photoresist stripping then the order in which they are carried out in a standard photolithography process is :

(1) P-Q-R-S   (2) Q-P-S-R   (3) P-S-R-Q   (4) R-P-Q-S

91. Which of the following options about tunnel diodes is *incorrect* ?

(1) The width of depletion region is high as compared to the p-n junction.

(2) Impurity concentration is high as compared to p-n junction.

(3) The V-I characteristics show the negative resistance region.

(4) Carrier velocities are very high.

92. The following structures are used in High Electron Mobility Transistor :

(1) Diffusion & self aligned ion implanted structure

(2) Recess gate structure

(3) Self aligned ion implented structure & recess gate structure

(4) Diffusion & recess gate structure

93. Preliminary filtration is one of the steps used in the liquid phase purification method of CNT. What is its purpose ?

(1) To remove bulk solid particles

(2) To remove bulk graphite particles

(3) To remove fullerences and catalysts

(4) To isolate MWCNT

94. By nano scale distribution of the .... in matrix improves the life and performance.

(1) Carbide   (2) Hydrides   (3) Tungesten   (4) Nitrides

95. Solar cell is made from bulk materials that is cut into water of .... thickness.

    (1) 120-180 μm   (2) 120-220 μm   (3) 180-220 μm   (4) 180-240 μm

96. An LCD requires a power of .... to light up are segment of a seven segment display system.

    (1) 20 μm   (2) 10 mW   (3) 10 nW   (4) 02 μW

97. An abrupt silicon pn-junction has dopant concentration of $N_a = 2 \times 10^{16}$ cm^{-3} and $N_d = 2 \times 10^{15}$ cm^{-3} at T = 300 K. A reverse voltage of $V_R = 8$ V is applied to the pn-junction. What will be the maximum electric field in the depletion region ?

    (1) 3.23×10^5 V/cm   (2) 3.5×10^4 V/cm

    (3) 7.0×10^4 V/cm   (4) 6.45×10^5 V/cm

98. The impurity level in an extrinsic semiconductor about .... of pure semiconductor.

    (1) 10 atoms for 108 atoms   (2) 1 atom for 108 atoms

    (3) 1 atom for 104 atoms   (4) 1 atom for 100 atoms

99. When the temperature of an extrinsic semiconductor is increased, the pronounced effect is on ....

    (1) Minority carriers   (2) Majority carriers

    (3) Minority & Majority carriers   (4) Junction capacitance

100. Mobility of holes is .... mobility of electrons in intrinsic semiconductors.

    (1) Equal   (2) Greater than   (3) Less than   (4) Cannot define

Q. NO.	A	B	C	D
1	2	4	3	4
2	3	2	2	1
3	1	1	4	2
4	4	3	1	3
5	3	3	2	2
6	2	4	4	4
7	4	3	3	3
8	1	1	1	2
9	2	2	3	1
10	4	4	4	1
11	1	3	1	2
12	3	1	2	1
13	2	3	3	1
14	3	1	1	4
15	4	3	2	3
16	1	4	4	2
17	3	2	1	4
18	2	4	4	3
19	1	1	2	1
20	4	2	3	2
21	3	4	2	3
22	2	1	1	1
23	4	2	4	3
24	1	3	1	1
25	2	2	4	3
26	4	4	3	4
27	3	3	2	2
28	1	2	3	4
29	3	1	3	1
30	4	1	2	2
31	2	2	3	3
32	1	3	1	2
33	1	1	3	4
34	4	4	1	1
35	3	3	3	2
36	2	2	4	4
37	4	4	2	3
38	3	1	4	1
39	1	2	1	3
40	2	4	2	4
41	4	1	1	1
42	2	2	3	3
43	1	3	2	4
44	3	1	3	2
45	3	2	4	4
46	4	4	1	2
47	3	1	3	3
48	1	4	2	1
49	2	2	1	2
50	4	3	4	4

Answer keys of PHD-EE-2023-24 (E.C.E) entrance exam dated 22.03.2024

Q. NO.	A	B	C	D
**Answer keys of PHD-EE-2023-24 (E.C.E) entrance exam dated 22.03.2024**
51	1	1	2	2
52	2	3	1	1
53	3	4	1	4
54	1	2	4	1
55	2	4	3	4
56	4	2	2	3
57	1	3	4	2
58	4	1	3	3
59	2	2	1	3
60	3	4	2	2
61	1	3	2	4
62	3	2	3	2
63	4	4	1	1
64	2	1	4	3
65	4	2	3	3
66	2	4	2	4
67	3	3	4	3
68	1	1	1	1
69	2	3	2	2
70	4	4	4	4
71	3	1	4	1
72	1	3	2	2
73	3	2	1	3
74	1	3	3	1
75	3	4	3	2
76	4	1	4	4
77	2	3	3	1
78	4	2	1	4
79	1	1	2	2
80	2	4	4	3
81	2	2	4	2
82	1	1	1	3
83	4	4	2	1
84	1	1	3	4
85	4	4	2	3
86	3	3	4	2
87	2	2	3	4
88	3	3	2	1
89	3	3	1	2
90	2	2	1	4
91	4	2	1	1
92	1	1	3	3
93	2	1	4	2
94	3	4	2	3
95	2	3	4	4
96	4	2	2	1
97	3	4	3	3
98	2	3	1	2
99	1	1	2	1
100	1	2	4	4