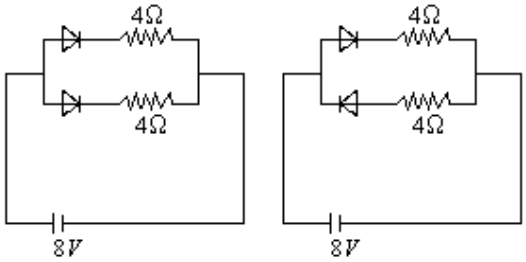
ELECTRONIC DEVICES

1. Current flowing in each of the following circuits A and B respectively are:



(Circuit 1) (Circuit 2)

1) 1A, 2A 2) 2A, 1A 3) 4A, 2A 4) 2A, 4A

2. Among the following one statement is not correct when a junction diode is in forward bias

1) the width of depletion region decreases

2) free electron on n- side will move towards the junction

3) holes on p -side move towards the junction

4) electron on n- side and holes on p-side will move away from junction

3. In a n - type semiconductor, the fermi energy level lies

1) in the forbidden energy gap nearer to the conduction band.

2) in the forbidden energy gap nearer to the valence band.

3) in the middle of forbidden energy gap

4) outside the forbidden energy gap

4. Consider a.p-n junction as a capacitor, formed with p and n material acting as thin metal electrodes and depletion layer width acting as separation between them. Basing on this assume that a n-p-n transistor is working as a amplifier in CE configuration. If C_1 and C_2 are the base-emitter and collector emitter junction capacitances, then :

1) $C_1 > C_2$ 2) $C_1 < C_2$ 3) $C_1 = C_2$ 4) $C_1 = C_2 = O$

5. An n-pn transistor power amplifier in C-E configuration gives

1) Voltage amplification only 2) Current amplification only

3) Both current and voltage amplification 4) Only power gain of unity

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6. In n-p-n transistor, in CE configuration:

(1) The emitter is heavily doped than the collector

(2) Emitter and collector can be interchanged

(3) The base region is very thin but is heavily doped

(4) The conventional current flows from base to emitter

1. (1) and (2) are correct
2. (1) and (3) are correct
3. (1) and (4) are correct
4. (2) and (3) are correct

7. When n - p - n transistor is used as an amplifier:

1. electrons move from base to collector
2. holes moves from emitter to base
3. holes move from collector to base
4. holes move from base to emitter

8. In a transistor circuit, when the base current is increased by 50micro-amperes keeping the collector voltage fixed at 2 volts, the collector current increases by 1mA. The current gain of the transistor is

1) 20 2) 40 3) 60 4) 80

9. A common emitter transistor amplifier has a current gain of 50. If the load resistance is 4kilo ohm, and input resistance is 500 ohms, the voltage gain of amplifier is

1) 100 2) 200 3) 300 4) 400

10. Consider the following statements A and B identify the correct of the give answer.

1) The width of the depletion layer in a p-n junction diode increases in forward bias.

2) In an intrinsic semiconductor the fermi energy level is exactly in the middle of the forbidden gap

1) A is true and B is false
2) Both A and B are false
3) A is false and B is true
4) Both A and B are true

11. A full-wave p-n diode rectifier uses a load resistor of 1500Ω. No filter is used. The forward bias resistance of the diode is 10Ω. The efficiency of the rectifier is

1) 81.2% 2) 40.6% 3) 80.4% 4) 40.2%

12. If an intrinsic semiconductor is heated, the ratio of free electrons to holes is

1) greater than one
2) less than one
3) equal to one
4) decrease and becomes zero

13. In a transistor circuit the base current changes from 30 to 90. If the current gain of the transistor is 30, the change in the collector current is

1) 4 mA 2) 2 m A 3) 3.6 mA 4) 1.8 mA

14. A p-n-p transistor is said to be in active region of operation, When:

1) Both emitter junction and collector junction are forward biased

2) Both emitter junction and collector junction are reverse biased

3) Emitter junction is forward biased and collector junction is reverse biased

4) Emitter junction is reverse biased and collector junction is forward biased

15. Consider the following statements A and B and identify the correct answer

1): Germanium is preferred over silicon in the construction of zener diode.

2): Germanium has high thermal stability than silicon in the construction of Zener diode

1) Both (1) and (2) are true 2) Both (1) and (2) are false

3) (1) is true but (2) is false 4) (1) is false but (2) is true

16. A Zener diode when used as a voltage regulator is connected

(1) in forward bias (2) in reverse bias

(3) in parallel to the load (4) in series to the load

1) (1) and (2) are correct 2) (2) and (3) are correct

3. (1) only is correct 4. (4) only is correct

17. Consider the following statements A and B and identify the correct answer

(1) A Zener diode is always connected in reverse bias to use it as voltage

(2) The potential barrier of a p - n junction lies between 0.1 to 0.3V, approximately

1. A and B are correct 2. A and B are wrong

3. A is correct but B is wrong 4. A is wrong but B is correct

18. The current gain of transistor in a common emitter circuit is 40. The ratio of emitter current to base current

1) 40 2) 41 3) 42 4) 43

19. The current gain (β) of a transistor in common emitter mode is 40. To change the collector current by 160mA, the necessary change in the base current is (at constant V_{CE})

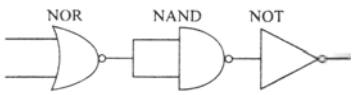
1) 0.25A 2) 4 A 3) 4mA 4) 40mA

20. An n-type and p-type silicon can be obtained by doping pure silicon with

1) Arsenic and phosphorus 2) Indium and aluminium

3) Phosphorous and indium 4) aluminium and boron

21. The circuit is equivalent to



1) NOR gate 2) OR gate 3) AND gate 4) NAND gate

22. A p-n photodiode is made of a material with a band gap of 2.0 eV. The minimum frequency of the radiation that can be absorbed by the material is nearly

1) 1×10^{14} Hz 2) 20×10^{14} Hz 3) 10×10^{14} Hz 4) 5×10^{14} Hz

23. If the lattice parameter for a crystalline structure is 3.6 $\overset{0}{A}$, then the atomic radius in fcc crystal is

1) 2.92 $\overset{0}{A}$ 2) 1.27 $\overset{0}{A}$ 3) 1.81 $\overset{0}{A}$ 4) 2.10 $\overset{0}{A}$

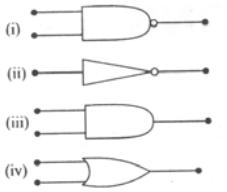
24. The voltage gain of an amplifier with 9% negative feedback is 10. The voltage gain without feedback will be

1) 1.25 2) 100 3) 90 4) 10

25. A p-n photodiode is fabricated from a semiconductor with a band gap of 2.5eV. It can detect a signal of wavelength

1) 4000 nm 2) 6000 nm 3) 4000 $\overset{0}{A}$ 4) 6000 $\overset{0}{A}$

26. The symbolic representation of four logic gates are given below



The logic symbols for OR, NOT and NAND gates the respectively

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

27. A transistor is operated in common-emitter configuration at V_C = 2 V such that a change in the base current from 100 μA to 200 μA produces a change in the collector current from 5mA to 10mA. The current gain is

1) 100 2) 150 3) 50 4) 75

28. Sodium has body centered packing. Distance between two nearest atoms is 3.7 $\overset{0}{A}$. The lattice parameter is

1) 4.3 $\overset{0}{A}$ 2) 3.0 $\overset{0}{A}$ 3) 8.6 $\overset{0}{A}$ 4) 6.8 $\overset{0}{A}$

29. Let n_p and n_e be the number of holes and conduction electrons in an intrinsic semiconductor

1) $n_p > n_e$ 2) $n_p = n_e$ 3) $n_p < n_e$ 4) $n_p \neq n_e$

30. A p-type semiconductor is

1) positively charged 2) negatively charged

3) uncharged 4) uncharged at 0 K but charged at higher temperatures

31. If the two ends of a p-n junction are joined by a wire,

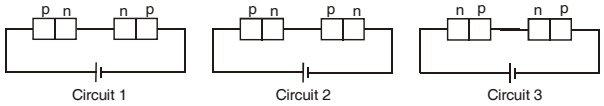
1) there will not be a steady current in the circuit

2) there will be a steady current from the n-side to the p-side

3) there will a steady current from the p-side to the n-side

4) there may or may not be a current depending upon the resistance of the connecting wire

32. Two identical p-n junction may be connected in series with a battery in three ways. The



potential difference across the two p-n junctions are equal in

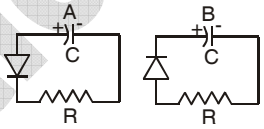
1) circuit 1 and circuit 2 2) circuit 2 and circuit 3

3) circuit 3 and circuit 1 4) circuit 1 only

33. Two identical capacitors A and B are charged to the same potential V and are connected in two circuits at t=0 as shown in figure. The charges on the capacitors at a time t=CR are, respectively,

1) VC, VC 2) VC/e, VC

3) VC, VC/e 4) VC/e, VC/e



34. In a transistor,

1) the emitter has the least concentration of impurity

2) the collector has the least concentration of impurity

3) the base has the least concentration of impurity

4) all the three regions have equal concentrations of impurity

35. Transistor input characteristics curves are the graphs drawn with

1) collector current I_C on y-axis and the collector emitter voltage V_{CE} on x-axis for a constant base current

2) base current I_B on y-axis and the base-collector voltage V_{BE} on x-axis for a constant collector emitter voltage

3) base current I_B on y-axis and the collector-emitter voltage V_{CE} on x-axis for a constant collector current

4) base current I_B on y-axis and collector current I_C on x-axis with constant base-emitter voltage

36. Pure or intrinsic semiconductor at absolute zero is a

1) perfect insulator 2) super conductor 3) good conductor 4) semiconductor

37. A doped semiconductor is called

1) extrinsic semiconductor 2) intrinsic semiconductor

3) perfect insulator 4) perfect conductor

38. A pure semiconductor has

1) an infinite resistance at 0^0 C

2) a finite resistance which does not depend upon temperature

3) a finite resistance which decreases with temperature

4) a finite resistance which increases with temperature

39. n-type semiconductor is obtained by the addition of

1) pentavalent impurity 2) trivalent impurity

3) divalent impurity 4) monovalent impurity

40. p-type germanium crystal is

1) negatively charged 2) positively charged

3) electrically neutral 4) none of these

41. Temperature coefficient of resistance of a semiconductor is

1) positive 2) negative 3) constant 4) positive or negative

42. Depletion region is

1) positively charged 2) negatively charged

3) completely neutral and has no charge

4) a charged region of positive and negative ions at the junction

43. A p-n junction has

1) more p-type and less n-type semiconductor

2) more n-type and less p-type semiconductor

3) p and n-type semiconductor in equal quantity

4) p and n-type semiconductors with depletion layer in between

44. Zener diode is used for

1) Rectification 2) amplification 3) stabilization 4) modulation

45. The minority carrier concentration is largely a function of

1) the amount of doping 2) temperature

3) forward biasing voltage 4) reverse biasing voltage

46. Fermi energy is the amount of energy which

1) a valence electron can have at room temperature

2) must be given to an electron to move it to the conduction band

3) must be given to a hole to move it to the valence band

4) a hole can have at room temperature

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47. In the energy band diagram of a p-type semiconductor

1) the acceptor band is nearer to the conduction band

2) the acceptor band is nearer to the valence band

3) the donor band is nearer to the valence band

4) the donor band is nearer to the conduction band

48. In a depletion region of p-n junction

1) p-side is positively charged and n-side is negatively charged

2) n-side is positively charged and p-side is negatively charged

3) there is hole concentration on p-side and electron concentration on n-side

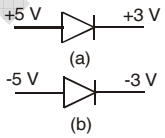
4) none of these

49. If the reverse bias voltage of a p-n junction is increased within limits, the reverse saturation current will

1) decreases 2) increase

3) remain unaffected 4) none of these

50. In the adjacent figure



1) both (a) and (b) are forward biased

2) both (a) and (b) are reverse biased

3) (a) is forward biased and (b) is reverse biased

4) (a) is reverse biased and (b) is forward biased

51. The width of forbidden gap in silicon crystal is 1.2 eV. When the crystal is converted into a n-type semiconductor, the distance of fermi level from conduction band is

1) greater than 0.55 eV 2) equal to 0.55 eV

3) lesser than 0.55 eV 4) equal to 1.1 eV

52. A transistor has

1) two junctions 2) three junctions

3) four junctions 4) a single p-n junction

53. In common collector circuit, input resistance is

1) very high 2) very low

3) moderate 4) zero

54. In a transistor, if electrons flow into the emitter,

1) holes flow out of the emitter 2) electrons flow into the collector

3) electrons flow out of the base 4) holes flow out of the collector

55. In a p-n-p transistor, the saturation current is due to the flow of

1) electrons from the collector to the base

2) holes from the collector to the base

3) electrons from the emitter to the base

4) holes from the emitter to the base

56. The most heavily doped region in a transistor is

1) the base 2) the collector

3) the emitter 4) both the emitter and the collector

57. In a p-n-p transistor, the emitter current in the external circuit is

1) Due to flow of electrons out of the emitter 2) Flow of electrons into the emitter

3) Flow of holes into the emitter 4) Flow of holes out of the emitter

58. In a heavily doped junction diode, the width of the depletion layer is

1) very narrow 2) very wide

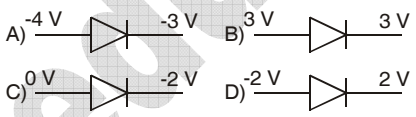
3) always has the same width 4) changes with the physical size of the diode

59. In an unbiased diode, the electric field across the junction is directed from the

1) n side to p side 2) p side to n side

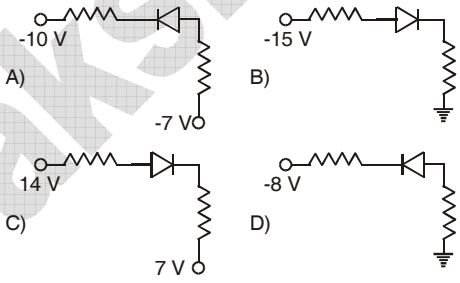
3) there is no field 4) can be in any direction

60. In which of the following figures, the diode is forward biased ?



1) A 2) B 3) C 4) D

61. In which of the following figures, the diode is in reverse bias?



1) A 2) B 3) C 4) D

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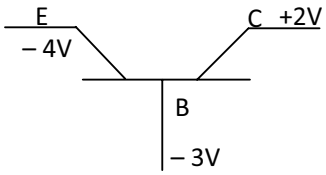
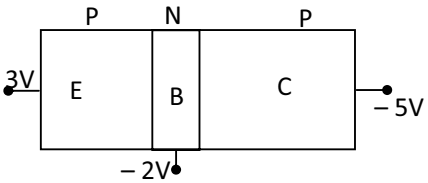
62. Which one of the following transistors is properly biased in the active region of transistor functioning?





1) First transistor only 2) Second transistor only

3) Both transistors 4) none of the transistors is properly biased

63. Which of the following logic gates the given truth table represents?

A	B	Y
0	0	0
0	1	0
1	0	0
1	1	1

1) NOT gate 2) NOR gate

3) OR gate 4) AND gate

64. Which of the following logic gates the given truth table represents?

A	B	Y
0	0	1
0	1	0
1	0	0
1	1	0

1) XOR gate

2) NOR gate

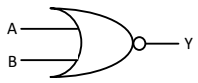
3) AND gate

4) OR gate

65. The logic symbol shown in figure represents?

1) OR gate 2) XOR gate

3) NAND gate 4) NOR gate



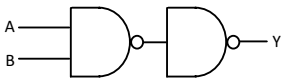
66. The arrangement shown in figure performs the logic function of

1) AND gate

2) NAND gate

3) OR gate

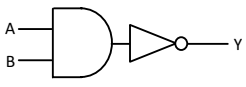
4) XOR gate



67. The name of the gate obtained by the combination as shown is

1) NAND 2) NOR

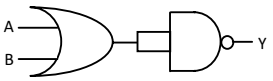
3) NOT 4) XOR



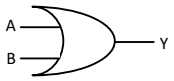
68. Identify the gate represented by the block diagram

1) AND 2) NOT

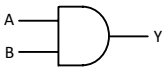
3) NAND 4) NOR



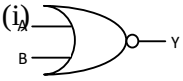
69. Given below are four logic gate symbols. Those for OR, NOR and AND respectively



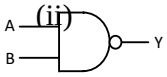
(i)



(ii)



(iii)



(iv)

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

70. In Boolean expression which gate is expressed as $Y = \overline{A + B}$

1) OR 2) NAND 3) AND 4) NOR

71. What will be the inputs of A and B for Boolean expression $(\overline{A + B}) + (\overline{A.B})$ **= 0 ?**

1) 0, 0 2) 0, 1 3) 1, 0 4) 1, 1

72. In the given Boolean expression, $Y = A.\overline{B} + B.\overline{A}$ **, if A = 1, B = 1 then Y will be**

1) 0 2) 1 3) 11 4) 10

73. Which of the following statements concerning depletion region of an p-n junction diode are true?

1) The width of the zone is independent of densities of dopants

2) the width of the zone is dependent on the density of dopants

3) the electric field in the zone is provided by the electrons in conduction band and holes in valence band

4) the electric field in the zone is produced by the ionized dopant atoms

1) A and B are true 2) B and C are true 3) B and D are true 4) A and C are true

74. Consider the following statements:

A) The base region of a transistor transfers the entire current towards the collector.

B) The base region is very thin and is lightly doped.

1) A and B are correct 2) Only B is correct 3) Only A is correct 4) A and B are false

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75. **Match the following:**

List – I	**List – II**
a) Arsenic	e) donor impurity
b) Emitter	f) highly doped
c) Base	g) poorly doped
d) Indium	h) acceptor impurity

1) a – e, b – g, c – f, d – h
2) a – f, b – e, c – g, d – h
3) a – f, b – g, c – h, d – e
4) a – e, b – f, c – g, d – h

76. **Match the following:**

List – I	**List – II**
a) Forbidden energy gap of a semiconductor	e) 10^{-6} m
b) Knee voltage of germanium diode	f) 1 MeV
c) Width of depletion layer	g) 0.7 V
d) Forward voltage of silicon diode	h) 1 Ev
	i) 0.3 V

1) a–i, b–h, c–e, d–g
2) a–h, b–i, c–e, d–g
3) a–h, b–i, c–f, d–e
4) a–f, b–i, c–e, d–g

77. **Match the following:**

List – I	**List – II**
a) hole	e) negative temperature coefficient of resistance
b) copper	f) electron gap
c) doping	g) positive temperature coefficient of resistance
d) germanium	h) addition of impurity to increase the conductivity

1) a-h, b-e, c-f, d-g 2) a-e, b-f, c-g, d-h 3) a-f, b-g, c-h, d-e 4) a-g, b-h, c-e, d-f

78. **Match the following:**

List – I	**List - II**
a) Intrinsic semiconductor	e) prepared by adding antimony
b) N-type semiconductor	f) immobile ions
c) P-type semiconductor	g) silicon
d) Depletion layer	h) prepared by adding indium

1) a-g, b-e, c-h, d-f
2) a-h, b-f, c-e, d-g
3) a-e, b-g, c-f, d-h
4) a-f, b-h, c-g, d-e

79. **Match the following:**

List – I	**List – II**
a) Emitter	e) transistor

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b) base f) moderately doped

c) collector g) lightly doped

d) transfer of resistance h) heavily doped

1) a-f, b-e, c-h, d-g 2) a-g, b-f, c-e, d-h 3) a-h, b-g, c-f, d-e 4) a-e, b-h, c-g, d-f

80. **Match the following:**

List – I	**List – II**
a) conductor	f) 5 eV
b) semiconductor	g) 0 eV
c) insulator	h) no. of holes>no. of electrons
d) n-type semiconductor	i) 1 eV
e) p-type semiconductor	j) no. of electrons>no. of holes

1) a-i, b-g, c-h, d-f, e-j 2) a-f, b-g, c-h, d-e, e-I 3) a-h, b-j, c-i, d-j, e-h

4) a-g, b-i, c-f, d-j, e-h

81. **Match the following:**

List – I	**List – II**
a) emitter	f) current conduction by electrons
b) base	g) lightly doped
c) collector	h) current conduction by holes
d) p-n-p transistor	i) highly doped
e) n-p-n transistor	j) moderately doped

1) a – j, b – g, c – i, d – f, e – h 2) a – g, b – j, c – i, d – f, e – h

3) a – g, b – i, c – j, d – h, e – f 4) a – i, b – g, c – j, d – h, e – f

82. **Match the following:**

List – I	**List – II**
a) current gain	e) $\frac{\beta^2 R_L}{R_i}$
2) voltage gain	f) i_b+i_c
3) power gain	g) $\frac{\Delta V_{CE}}{\Delta V_{BE}}$
4) emitter current, i_e	h) $\frac{\Delta i_C}{\Delta i_B}$

1) a-f, b-e, c-f, d-h 2) a-h, b-g, c-e, d-f

3) a-g, b-e, c-h, d-f 4) a-e, b-h, c-g, d-f

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Assertion & Reason: In each of the following questions, a statement is given and a corresponding statement or reason is given just below it. In the statements, marks the correct answer as

1) If both Assertion and Reason are true and Reason is correct explanation of Assertion.

2) If both Assertion and Reason are true but Reason is not the correct explanation of Assertion.

3) If Assertion is true but Reason is false.

4) If both Assertion and Reason are false.

83. [A]: Transistor in CE mode can be used as amplifier.
[R]: A small change in base current produces a relatively large change in collector current.

84. [A]: An unbiased p-n junction diode has a depletion layer.
[R]: The depletion layer is formed due to diffusion of electrons and holes.

85. [A]: Current gain in a common-emitter transistor circuit is more than unity.
[R]: Base current is a few milliamperes and the collector current is a few micro amperes.

86. [A]: In a n-type semiconductor fermi level shifts towards conduction band.
[R]: The donor energy levels will be very near to conduction band.

87. [A]: In forward bias, width of depletion layer decreases.
[R]: In forward bias, barrier potential decreases

88. [A]: In forward bias, p-side of junction must be connected to positive potential.
[R]: In reverse bias, n-side of junction must be connected to positive potential.

89. [A]: A half wave rectifier circuit is operating at n Hz mains frequency. The fundamental frequency in the ripple would be n/2 Hz.
[R]: Zener diode will function only in reverse bias

90. [A]: Diffusion current in a p-n is greater than the drift current in magnitude if the junction is forward biased.
[R]: In steady state, in p-n junction diffusion current equals to the drift current in magnitude

91. Assertion: In a transistor the base is made thin
Reason: A thin base makes the transistor stable.

92. Assertion: A transistor amplifier in common emitter configuration has a low input impedance.
Reason: The base to emitter region is forward biased.

93 Assertion: The logic gate NOT can be built using diode.
Reason: The output voltage and the input voltage of the diode have 180^0 phase difference.

94. Assertion: The number of electrons in a p-type silicon semiconductor is less than the output current
Reason: It is due to law of mass action

95. Assertion: In a common emitter transistor amplifier the input current is much less than the output current.
Reason: The common emitter transistor amplifier has very high input impedance.

96. Assertion: In common base configuration, the current gain of the transistor is less than unity
Reason: The collector terminal is reverse biased for amplification

97. Assertion: A p-n junction with reverse bias can be used as a photo-diode to measure light intensity.
Reason: In a reverse bias condition the current is small but is more sensitive to changes in incident light intensity

98. Assertion: NAND is universal gate
Reason: It can be used to describe all other logic gates

99. Assertion : In a common-emitter amplifier, the load resistance of the output circuit is 1000 times the load resistance of the input circuit. If $\alpha = 0.98$, then voltage gain is 49×10^3.
Reason: $\alpha = \frac{\beta}{1-\beta}$ (symbols have their usual meaning)

100. Assertion: Most amplifiers use common emitter circuit configuration
Reason: Its input resistance is comparatively higher

KEY:

1)	**3**	2)	**4**	3)	**1**	4)	**1**	5)	**3**	6)	**3**	7)	**1**	8)	**1**	9)	**4**	10)	**3**
11)	**1**	12)	**3**	13)	**4**	14)	**3**	15)	**2**	16)	**2**	17)	**1**	18)	**2**	19)	**3**	20)	**3**
21)	**1**	22)	**4**	23)	**2**	24)	**2**	25)	**3**	26)	**2**	27)	**3**	28)	**1**	29)	**2**	30)	**3**
31)	**1**	32)	**2**	33)	**2**	34)	**3**	35)	**3**	36)	**1**	37)	**1**	38)	**3**	39)	**1**	40)	**3**
41)	**2**	42)	**4**	43)	**4**	44)	**3**	45)	**2**	46)	**2**	47)	**2**	48)	**2**	49)	**3**	50)	**3**
51)	**3**	52)	**1**	53)	**1**	54)	**2**	55)	**1**	56)	**3**	57)	**1**	58)	**1**	59)	**1**	60)	**3**
61)	**2**	62)	**3**	63)	**4**	64)	**2**	65)	**4**	66)	**1**	67)	**1**	68)	**4**	69)	**4**	70)	**4**
71)	**4**	72)	**1**	73)	**3**	74)	**2**	75)	**4**	76)	**2**	77)	**3**	78)	**1**	79)	**3**	80)	**4**
81)	**4**	82)	**2**	83)	**1**	84)	**1**	85)	**3**	86)	**1**	87)	**2**	88)	**4**	89)	**4**	90)	**2**
91)	**3**	92)	**2**	93)	**4**	94)	**1**	95)	**3**	96)	**3**	97)	**1**	98)	**1**	99)	**3**	100)	**1**

Solutions

1. Ans:3

Sol: In circuit 'A'

$$i = \frac{V}{R} = \frac{8}{2} = 4A$$

[both the 4Ω, resistors are in parallel and both the p-n junction diodes are forward biased]

in circuit 'B'

$$i = \frac{V}{R} = \frac{8}{2} = 2A$$

[one p-n junction diode is in reverse bias, hence no current flows through this diode]

2. Ans: 4

Sol. Electrons on n-side and holes on p-side will move towards junction

3. Ans: 1

4. Ans: 1

5. Ans: 3

6. Ans: 3

Sol. a) In transistor emitter is heavily doped than collector.

2) Conventional current is opposite to the direction of flow of electrons.

7. Ans: 1

8. Ans: 1

Sol: Current gain of transistor $\beta = \frac{\Delta I_C}{\Delta I_B} = \frac{1\times10^{-3}}{50\times10^{-6}} = 20$

9. Ans :4

Voltage gain = $50\times\frac{4000}{500} = 400$

10. Ans: 3

11. Ans: 1

12. Ans: 3

Sol. In an intrinsic semiconductor number of free electron and holes are equal when they are hated because it is a pure semi conductor

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13. Ans :4

Sol: $\Rightarrow \beta = \frac{\Delta I_C}{\Delta I_B} \Rightarrow 30 = \frac{\Delta I_C}{(90-30)\mu A}$

$\Delta I_C = 30 \times 60 \times 10^{-6} = 1800 \times 10^{-6}$

= 1.8mA

14. Ans: 3

Sol. In an active region emitter junction is forward biased and collector junction is reverse biased.

15. Ans: 2

16. Ans: 2

Sol. To use Zener diode as a voltage regulator it is connected in reverse bias and parallel to the load.

17. Ans: 1

Sol. To use Zener diode as a voltage regulator it is connected in reverse bias and parallel to the load.

18. Ans :2

Sol: $I_E = I_C + I_B$

$\Delta I_E = \Delta I_C + \Delta I_B$

$\Rightarrow \frac{\Delta I_E}{\Delta I_B} = \frac{\Delta I_C}{\Delta I_B} + 1 = 40 + 1 = 41$

19. Ans : 3

$\beta = \frac{\Delta I_c}{\Delta I_B} \Rightarrow \Delta I_B = \frac{\Delta I_c}{\beta} = 4mA$

20. Ans: 3

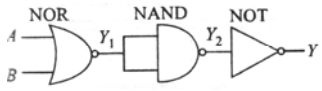
Sol. For obtaining 'n' type semi conductor V group element is doped with silicon.

Ex: Phosphorus

For obtaining 'p' type semiconductor III group element is doped with silicon.

Ex: Indium

21: (a)



Same as NOR Gate

NOR Gate

0 0 1

0 1 0

1 0 0

1 1 0

22. (4) Band gap = 2 eV

Wavelength of radiation corresponding to this energy,

$$\lambda = \frac{h_c}{E} = \frac{12400\,eV}{2\,eV} = 6200\,\overset{0}{A}$$

The frequency of this radiation

$$= \frac{c}{\lambda} = \frac{3\times10^{8}\,m/s}{6200\times10^{-10}\,m}$$

$$\Rightarrow \upsilon = 5\times10^{14}\ \text{Hz}$$

23. (2) The atomic radius in a f.c.c. crystal is $\frac{a}{2\sqrt{2}}$

Where a is the length of the edge of the crystal.

$$\therefore \text{ Atomic radius} = \frac{3.6\,\overset{0}{A}}{2\sqrt{2}} = 1.27\,\overset{0}{A}$$

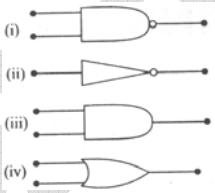
24. (2) One applies negative feed-back, which reduces the output but makes it very stable. For voltage amplification amplifiers the value of output voltage without the negative feed-back could be very high. The value max shown here is 100.

25. (3) Band gap = 2.5 eV

$$= \frac{12400eV\,\overset{0}{A}}{2.5\,eV} = 4960\,\overset{0}{A}$$

4000 $\overset{0}{A}$ can excite this.

26 (2)



OR gate, NOT gat and NAND gates are (iv), (ii) and (i) respectively.

(iii) represents AND gate

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27. (3) For common emitter, the current gain is $\beta = \left(\frac{\Delta I_C}{\Delta I_B}\right)_{V_{CE}}$

i.e., at a given potential difference of CE

$$\beta = \frac{\left(10\times10^{-3} - 5\times10^{-3}\right)A}{\left(200\times10^{-6} - 100\times10^{-6}\right)A} = \frac{5\times10^{-3}}{100\times10^{-6}} = 50$$

28. (1) Distance between nearest atoms in body centered cubic lattice (bc3), d = $\frac{\sqrt{3}}{2}a$

Given d = 3.7 $\overset{0}{A}$, a = $\frac{3.7\times2}{\sqrt{3}} = 4.3\overset{0}{A}$

91. Sol:(3)

The base is lightly doped and very thin, this constructional feature is key of transistor action due to which only few holes (less than 5%) are able to combine with the electron in base region. Most of the holes coming from the emitter are able to diffuse through the base region to the collector region.

92. Sol: (2)

Input impedance of common emitter configuration = $\frac{\Delta V_{BE}}{\Delta i_B}\Big|_{V_{CE}=constant}$

Where ΔV_{BE} = voltage across base and emitter, Δi_B = base current which is order of few microampere.

Thus input impedance of common emitter is low.

93 Sol :(4)

In diode the output is in same phase with the input therefore it cannot be used to built NOT gate.

94. Sol :(1)

According to law of mass action, $n_i^2 = n_e n_h$.

In p-type semiconductor $n_h > n_e$.

95. Sol :(3)

A good amplifier stage is one which has high input resistance and low output resistance. A transistor in CB configuration has a very low resistance $(\simeq 20\Omega)$ and a very high output resistance $(\simeq 1M\Omega)$. It is just the reverse of what is required. The CE configuration is better, its input resistance is about 1 $k\Omega$ and output resistance about 10 $k\Omega$. Although input resistance of CE is not very high but it still prefers better amplifier.

96. Sol :(3)

The common base configuration of npn transistor is used for voltage amplification. The current amplification is very small. Assertion is true. The collector is reverse biased for voltage amplification. The reason given has not mentioned that is voltage amplification. The reason is therefore incomplete by itself. It is wrong

97. Sol :(1)

98. Sol :(a) Both assertion and reason are true and reason is the correct explanation of assertion. NAND and NOR gates are treated as universal gates because all other basic gates AND gate OR gate and NOT gate can be constructed using only NAND gate (or NOR gate)

99.. Sol:(3)

We know that

$\alpha = \frac{\Delta i_C}{\Delta i_E}$ and $\beta = \frac{\Delta i_C}{\Delta i_B}$

Also $\beta = \frac{\alpha}{1-\alpha} = \frac{0.98}{1-0.98} = 49$

$\therefore$ Voltage gain = $\beta = \frac{R_2}{R_1} = 49 \times 1000 = 49 \times 10^3$

100. Sol:(1)

Most amplifiers use the common emitter circuit configuration because the circuit offers both current and voltage gains resulting in much higher power gain that can be obtained by a common-base amplifier. The other consideration for the use of the common-emitter amplifier is that its input resistance is higher and of the order of load resistance.

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