Exercise-1

* Marked Questions may have more than one correct option.

ONLY ONE OPTION CORRECT TYPE

SECTION (A) : SEMICONDUCTOR, ENERGY BAND

1. A N-type semiconductor is
(1) Negatively charged (2) Positively charged (3) Neutral (4) None of these

2. The forbidden energy band gap in conductors semiconductors and insulators are EG_1, EG_2 and EG_3 respectively, The relation among them is
(1) $EG_1 = EG_2 = EG_3$ (2) $EG_1 < EG_2 < EG_3$ (3) $EG_1 > EG_2 > EG_3$ (4) $EG_1 < EG_2 > EG_3$

3. The mobility of free electron is greater than that of free holes because
(1) The carry negative charge (2) They are light
(3) They mutually collide less (4) They require low energy to continue their motion

4. Electric conduction in a semiconductor takes place due to
(1) electrons only (2) holes only
(3) both electrons and holes (4) neither electron nor holes

5. Let n_p and n_e be the numbers 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) $n_p \neq n_e$

6. Let np and ne be the numbers of holes and conduction electrons in an extrinsic semiconductor
(1) $n_p > n_e$ (2) $n_p = n_e$ (3) $n_p < n_e$ (4) $n_p \neq n_e$

7. An electric field is applied to a semiconductor. Let the number of charge carrier be n and the average drift speed be υ. If the temperature is increased,
(1) both n and υ will increase (2) n will increase but υ will decrease
(3) υ will increases but n will decrease (4) both n and υ will decrease

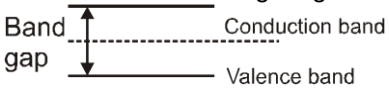
8. When an impurity is doped into an intrinsic semiconductor, the conductivity of the semiconductor
(1) increases (2) decreases (3) remains the same (4) become zero

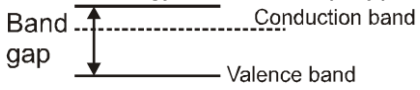
9. In a P-type semiconductor, the acceptor level is 57 meV, above the valence band. The maximum wave length of light required to produce a hole will be- **[MPPMT-1995]**
(1) 57 A_o (2) 57×10^{-3} A_o (3) 217100 A_o (4) 11.61×10 A_o

10. The electrical conductivity of pure germanium can be increased by
(1) increassing the temperature (2) doping acceptor impurities
(3) doping donor impurities (4) irradiating ultraviolet light on it.

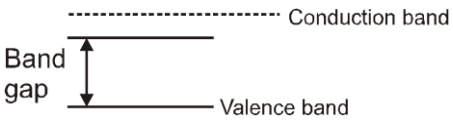
11. A semiconductor is doped with a donor impurity
(1) The hole concentration increases (2) The hole concentration decreases
(3) The electron concentration increases (4) The electron concentration decreases

12. Which of the following when added as an impurity into silicon produces n-type semiconductor ? **[AIPMT-1999]**
(1) P (2) Al (3) B (4) Mg

13. Which one of the following diagrams correctly represents the energy levels in the p–type semiconductor?
(1) 

(2) 

(3) 

(4) 

14. In p-type semiconductor, the major charge carriers are : **[AIPMT-1999]**

(1) holes (2) electrons (3) protons (4) neutrons

15. Copper and silsicon is cooled from 300 K to 60K, the specific resistance :- **[AIPMT-2001]**
(1) Decrease in copper but increase in silicon (2) Increase in copper but increase in silicon
(3) Increase in both (4) Decrease in both

16. Value of forbidden energy gap for semi conductor is : **[RPMT- 2000]**
(1) 1 eV (2) 6 eV (3) 0 eV (4) 3 eV

17. Ga As is a /an : **[RPMT- 2000]**
(1) element semiconductor (2) alloy semiconductor
(3) bad conductor (4) metalic semiconductor

18. The number of free electrons in Si at normal temperature is : **[RPMT- 2000]**
(1) $2.5 \times 10_6$ per cm_3 (2) $1.5 \times 10_{10}$ per cm_3 (3) $1.5 \times 10_{13}$ per cm_3 (4) $2.5 \times 10_{13}$ per cm_3

19. Hole are the charge carriers in : **[RPMT- 2000]**
(1) semiconductor (2) ionic solids
(3) p-type semiconductor (4) metals

20. Regarding a semi-conductor which one of the following is wrong ? **[RPMT-2003]**
(1) There are no free electrons at 0 K
(2) There are no free electrons at room temperature
(3) The number of free electrons increases with rise of temperature
(4) The charge carriers are electrons and holes.

21. At absolute zero, Si acts as : **[AIEEE-2002]**
(1) non-metal (2) metal (3) insulator (4) none of these

22. By increasing the temperature, the specific resistance of a conductor and ~ semiconductor: **[AIEEE-2002]**
(1) increases for both (2) decreases for both
(3) increases, decreases respectively (4) decreases, increases respectively

23. The energy band gap is maximum in : **[AIEEE-2002]**
(1) metals (2) superconductors
(3) insulators (4) semiconductors

24. A strip of copper and another of germanium are cooled from room temperature to 80 K. The resistance of : **[AIEEE-2003]**
(1) each of these decreases
(2) copper strip increases and that of germanium decreases
(3) copper strip decreases and that of germanium increases
(4) each of these increases

25. The difference in the variation of resistance with temperature in a metal and a semiconductor arises essentially due to the difference in the : **[AIEEE-2003]**
(1) crystal structure
(2) variation of the number of charge carries with temperature
(3) type of bonding
(4) variation of scattering mechanism with temperature

26. In a p-type semiconductor germanium is doped with : **[RPMT-2005]**
(1) gallium (2) aluminium (3) boron (4) all of these

27. In a good conductor of electricity, the type of bonding that exists is : **[RPMT-2005]**
(1) ionic (2) van der waal (3) covalent (4) metallic

28. Which of the following statements is true for an n-type semi-conductor ? **[RPMT-2006]**

(1) The donor level lies closely below the bottom of the conduction band
(2) The donor level lies closely above the top of the valence band
(3) The donor level lies at the halfway mark of the forbidden energy gap
(4) None of the above

29. An n-type semiconductor is **[RPMT-2007]**
(1) negatively charged (2) positively charged (3) neutral (4) none of the above

30. The difference in the variation of resistance with temperature in a metal and a semiconductor arises essentially due to the difference in the
(1) crystal structure (2) Change in the number of charge career
(3) type of bonding (4) None of these

31. In p-type semiconductors majority charge carriers are **[RPMT-2009]**
(1) electrons (2) holes (3) neutrons (4) protons

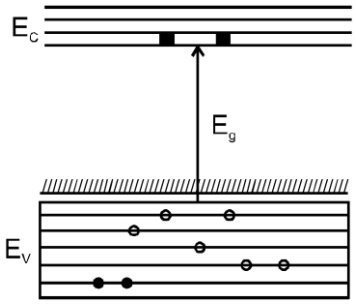
32. Wire P and Q have the same resistance at ordinary (room) temperature. When heated, resistance of P increases and that of Q decreases. we conclude that **[RPMT-2009]**
(1) p and Q are conductors of different materials.
(2) p is n-type semiconductor and Q is p-type semiconductor
(3) p is semiconductor and Q is conductor
(4) p is conductor and Q is semiconductor

33. The resistance of a semiconductor and of a conductor : **[RPMT-2011]**
(1) increases with temperature for both
(2) decreases with temperature for both
(3) increases and decreases respectively with increase in temperature
(4) decreases and increases respectively with increase in temperature

34. In semiconductors at a room temperature **[AIPMT-2004]**
(1) The valence band is completely filled and the conduction band is partially filled
(2) The valence band is completely filled
(3) The conduction band is completely empty
(4) The valence band is partially empty and the conduction band is partially filled

35. Carbon, Silicon and Germanium atoms have four valence electrons each. Their valence and conduction bonds are separated by energy band gaps represented by $(E_g)_C$, $(E_g)_{Si}$ and $(E_g)_{Ge}$ respectively. Which one of the following relationships is true on their case **[AIPMT- 2005]**
(1) $(E_g)_C < (E_g)_{Ge}$ (2) $(E_g)_C > (E_g)_{Si}$ (3) $(E_g)_C = (E_g)_{Si}$ (4) $(E_g)_C < (E_g)_{Si}$

36. In the energy band diagram of a material shown below, the open circles and filled circles denote holes and electrons respectively. The material is a/an : **[AIPMT-2007]**



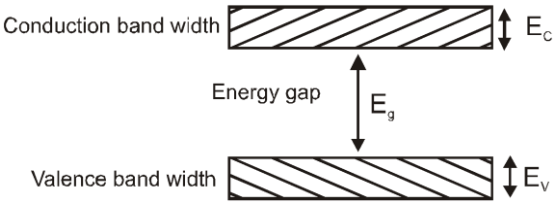
(1) p-type semiconductor (2) insulator (3) metal (4) n-type semiconductor

37. A piece of copper and another of germanium are cooled from room temperature to 77 K, the resistance of : **[AIEEE-2004]**
(1) each of them increases
(2) each of them decreases
(3) copper decreases and germanium increases
(4) copper increases and germanium decreases

38. The electrical conductivity of a semiconductor increases when electromagnetic radiation of wavelength shorter than 2480 nm, is incident on it. The band gap in (eV) for the semiconductor is : **[AIEEE-2005]**
(1) 1.1 eV (2) 2.5 eV (3) 0.5 eV (4) 0.7 eV

39. If the ratio of the concentration of electrons to that of holes in a semiconductor is $\frac{7}{5}$ and the ratio of currents is $\frac{7}{4}$, then what is the ratio of their drift velocities ? **[AIEEE 2006]**
(1) 5/8 (2) 4/5 (3) 5/4 (4) 4/7

40. If the lattice constant of this semiconductor is decreased, then which of the following is correct? **[AIEEE 2006]**



(1) All E_C, E_g, E_v increase (2) E_C and E_V increase, but E_g decreases
(3) E_c and E_v decrease, but E_g increases (4) All E_C,E_g, E_v decrease

41. Carbon, silicon and germanium have four valence electrons each. At room temperature which one of the following statements is most appropriate? **[AIEEE 2007]**
(1) the number of free conduction electrons is significant in C but small in Si and Ge
(2) the number of free conduction electrons is negligibly small in all the three.
(3) the number of free electrons for conduction is significant in all the three.
(4) the number of free electrons for conduction is significant only in Si and Ge but small in C.

42. In a crystal, the atoms are located at the position of :
(1) Maximum potential energy (2) Minimum potential energy
(3) Zero potential energy (4) Infinite potential energy

43. The laptop PC's modern electronic watches and calculators use the following for display :
(1) Single crystal (2) Poly crystal
(3) Liquid crystal (4) Semiconductors

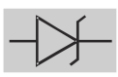
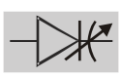
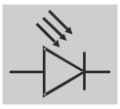
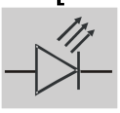
44. A p-type semiconductor is
(1) positively charged
(2) negatively charged
(3) uncharged
(4) uncharged at 0 K but charged at higher temperatures.

45. In good conductors of electricity, the type of bonding that exists is :
(1) Ionic (2) Vander Waals (3) Covalent (4) Metallic

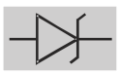
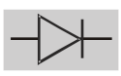
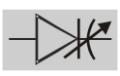
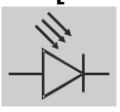
46. Bonding in a germanium crystal (semi-conductor) is :
(1) Metallic (2) Ionic (3) Vander Waal's type (4) Covalent

SECTION (B) : DIODES

1. Symbolic representation of photodiode is- **[RPMT-1993]**

(1)  (2)  (3)  (4) 

2. Symbol of zener diode- **[RPMT-2000]**

(1)  (2)  (3)  (4) 

3. Diffusion current in a p-n junction is greater than the drift current in magnitude
(1) if the junction is forward-baised (2) if the junction is reverse-baised
(3) if the junction is unbiased (4) in no case

4. In a p-n junction,
(1) new holes and conduction electrons are produced condtinuously throughout the material
(2) new holes and conduction electrons are produced continuously throughout the material except in the depletion region
(3) holes and conduction electrons recombine continuously throughout the material.
(4) holes and conduction electrons recombine continuously throughout the material except in the depletion region.

5. A hole diffuses from the p-side to the n-side in a p-n junction. This means that
(1) a bond is broken on the n-side and the electron freed from the bond jumps to the conduction band
(2) a conduction electron on the p-side jumps to a broken bond to complete it
(3) a bond is broken on the n-side and the electron freed from the bond jumps to a broken bond on the p-side to complete it
(4) a bond is broken on the p-side and the electron freed from the bond jumps to a broken bond on the n-side to complete it.

6. The depletion region of a P-N diode, under open circuit condition contains-
(1) Electrons (2) Holes
(3) Unmasked immobile impurity ions (4) Impurity atoms

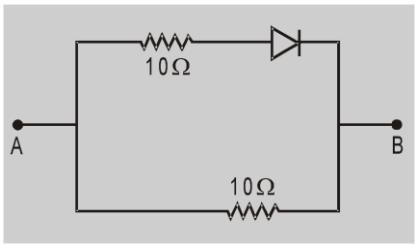
7. A semiconducting device is connected in a series circuit with a battery and a resistance. A current is found to pass through the circuit. If the polarity of the battery is reversed, the current drops to almost zero. The device may be
(1) an intrinsic semiconductor (2) a p-type semiconductor
(3) an n-type semiconductor (4) a p-n junction

8. Which is the wrong statement in following sentence? A device in which P and N type semiconductors are used is more useful then a vacuum tube because- **[MPPET-1992]**
(1) power is not necesary to heat the filament
(2) it is more stable
(3) very less heat is producted in it
(4) its efficiency is high due to a high voltage drop across the junction

9. When value of current increase in P-N junction, then the value of contact potential- **[RPET-1992]**
(1) decrease (2) increase
(3) remain unchanged (4) depends on temperature

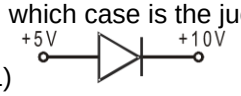
10. The contact potential at the junction site in a P-N junction is- **[RPET-1984]**
(1) positive on P side and negative on N side (2) negative on P side and positive on N side
(3) zero (4) infinite

11. If V_A and V_B denote the potentials of A and B, then the equivalent resistance between A and B in the adjoint electric circuit is-



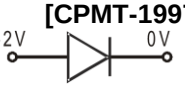
(1) 10 ohm if $V_A > V_B$ (2) 5 ohm if $V_A < V_B$
(3) 5 ohm if $V_A > V_B$ (4) 20 ohm if $V_A > V_B$

12. In which case is the juction diode is not reverse bias- **[CPMT-1997]**

(1) 

(2) 

(3) 

(4) 

13. Depletion layer in P-N junction is caused by-

(1) Drift holes (2) Diffusion of free carriers

(3) Migration of impurity ions (4) Drift of electrons

14. What accounts for the flow of charge carriers in forward and reverse biasing of silicon P-N diode- **[AIIMS-2000]**

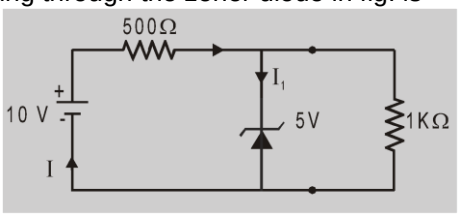
(1) Drift in both reverse and forward bias

(2) Drift in forward bias and diffusion in reverse bias

(3) Drift in reverse bias and diffusion in forward bias

(4) Diffusion in both forward and reverse bias

15. The current flowing through the zener diode in fig. is- **[CPMT-2000]**

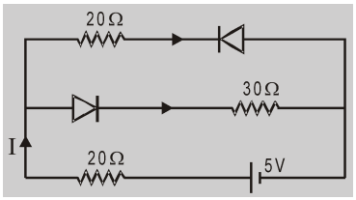


(1) 20 mA (2) 25 mA (3) 15 mA (4) 5 mA

16. The resistance of a reverse baised P-N junction diode is about- **[CPMT-2000]**

(1) 1 ohm (2) 10^2 ohm (3) 10^3 ohm (4) 10^6 ohm

17. Current I in the circuit shown will be- **[CPMT-2001]**



(1) $\frac{5}{40}$ (2) $\frac{5}{50}$ (3) $\frac{5}{10}$ (4) $\frac{5}{20}$

18. The value of barrier potential of P-N junction or N-P junction in Ge is- **[RPET-1986]**

(1) 0.03 volt in the direction of forward current

(2) 0.3 volt in the direction opposite of the forward current

(3) 25 volt in the direction opposite to the forward current

(4) 25 volt in the direction of the forward current

19. Diffusion current in a P-N junction is greater than the drift current in magnitude- **[RPMT-1993]**

(1) if the junction is forward-biased (2) if the junction is reverse-biased

(3) if the junction is unbaised (4) in no case

20. The barrier potential in a P-N junction is maximum in- **[RPMT-1993]**

(1) the reverse bias condition

(2) the forward bias condition

(3) the condition when the junction diode is used as rectifier

(4) zero bias condition

21. The diffusion current in a P-N junction is- **[RPMT-1994]**

(1) from the N-side to the P-side

(2) from the P-side to the N-side

(3) from the N-side to the P-side if the junction is forward-biased and in the opposite direction if it is reverse baised

(4) from the P-side to the N-side if the junction is forward-biased and in the opposite direction if it is reverse biased

22. When a P-N diode is reversed biased, then the current through the junction is mainly due to-
(1) diffusion of charge (2) nature of the material **[RPMT-1994]**
(3) drift of the charges (4) both drift and diffusion of the charges

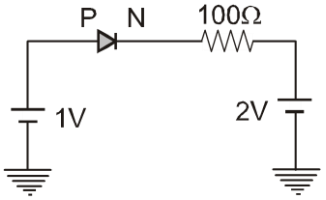
23. The drift current in a P-N junction is-
(1) from the N-side to the P-side
(2) from the P-side to the N-side
(3) from the n-side to the P-side if the junction is forward-biased and in the oposite direction if it is reverse biased.
(4) from the P-side to the N-side if the junction is forward-baised and in the opposite direction if it is reverse baised.

24. For a reverse bias P-N junction- **[RPMT-1995]**
(1) P region is positive and current is due to electrons
(2) P region is positive and the current is due to holes
(3) P region is negative and the current is due to electrons
(4) P region is negative and current is due to both electrons and holes

25. In P-N junction when does electron and holes stops moving from P to N and N to P- **[CPMT-1998]**
(1) Increase in +ve and –ve ions at junction (2) Increase in electron at junction
(3) Increase in holes at junction (4) Increase in holes and electrons at junction

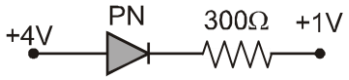
26. The depletion layer in silicon diode is 1 μm wide and the knee potential is 0.6 V, then the electric field in the depletion layer will be
(1) Zero (2) 0.6 Vm^{-1} (3) 6×10^4 V/m (4) 6×10^5 V/m

27. The current through an ideal PN-junction shown in the following circuit diagram will be **[AMU 1998]**



(1) Zero (2) 1 mA (3) 10 mA (4) 30 mA

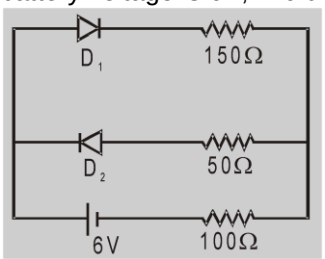
28. In the circuit given below, the value of the current is



(1) 0 amp (2) 10^{-2} amp (3) 1 amp (4) 0.10 amp

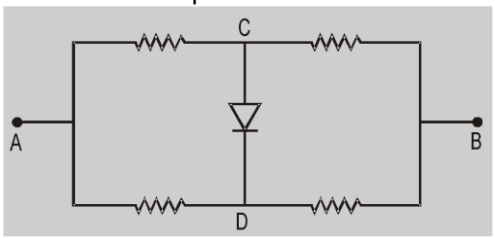
29. The maximum efficiency of full wave rectifier is **[J & K CET 2004]**
(1) 100 % (2) 25.20 % (3) 40.2 % (4) 81.2 %

30. The circuit shown in the figure contains two diodes each with a forward resistance of 50 ohm and with infinite reverse resistance. If the battery voltage is 6V, find the current through the 100 ohm resistance-



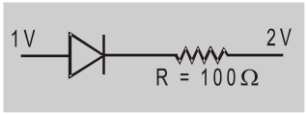
(1) 0.01 A (2) 0.05 A (3) 0.02 A (4) 0.03 A

31. Four equal resistors, each of resistance 10 ohm are connected as shown in the adjoining circuit diagram. Then the equivalent resistance between points A and B is-



(1) 40 ohm (2) 20 ohm (3) 10 ohm (4) 5 ohm

32. In the arrangement shown in fig. the current through diode is-



(1) 10 mA (2) 1 mA (3) 20 mA (4) Zero

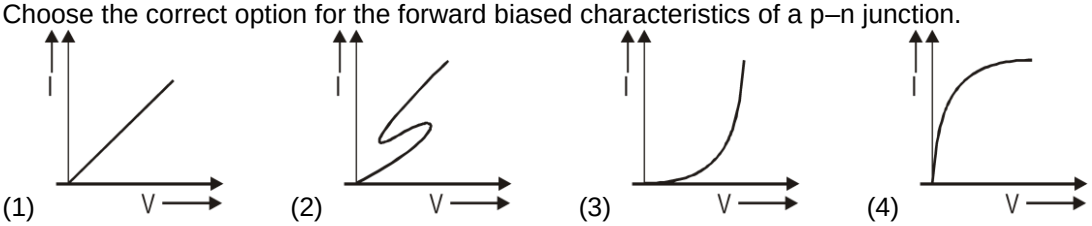
33. If the forward voltage in a semiconductor diode is changed form 0.5V to 2V, then the forward current changes by 1.5 mA. The forward resistance of diode will be-

(1) 1KΩ (2) 2KΩ (2) 4KΩ (4) 8KΩ

34. When the reverse potential in a semiconductor diode are 10V and 20V, then the corresponding reverse currents are 25μA and 50μA respectively. The reverse resistance of junction diode will be-

(1) 40Ω (2) $4 \times 10_5$ Ω (3) 40KΩ (4) $4 \times 10_{-5}$ Ω

35. Choose the correct option for the forward biased characteristics of a p–n junction.



36. The emitter-base junction of a transistor is .....biased while the collector-base junction is .....biased **[KCET 2004]**

(1) Reverse, forward (2) Reverse, reverse (3) Forward, forward (4) Forward, reverse

37. If the two ends of a P-N junction are joined by a wire- **[RPMT-1996]**

(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.

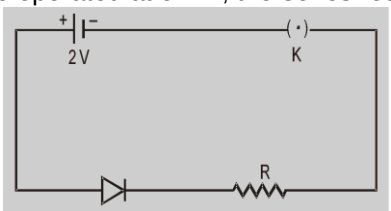
38. Region which have no free electron and holes in a P-N juction is- **[RPMT-1997]**

(1) P-region (2) N-region (3) junction (4) depletion region

39. In P-N junction at the near junction there are- **[RPMT-1998]**

(1) only positive ions (2) only negative ions
(3) positive and negative ion both (4) elerctron and holes both

40. A diode made forward biased by a two volt battery however there is a drop of 0.5 V across the diode which is independent of current. Also a current greater then 10 mA produces large joule loss and damages diode. If diode is to be operated at 5 mA, the series resistance to be put is-**[RPMT-1998]**



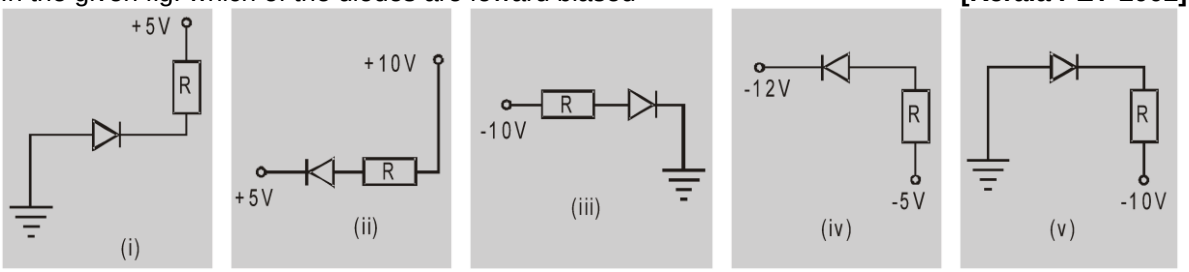
(1) 3 KΩ (2) 300 KΩ (3) 300 Ω (4) 200 KΩ

41. The ratio of resistance for forward to reverse bias of P–N junction diode is- **[MPPET-2000]**
(1) 10_2 : 1 (2) 10_{-2} : 1 (3) 1 : 10_{-4} (4) 1 : 10_4

42. Zener diode is used- **[RPMT-2001]**
(1) As an amplifier (2) As a rectifier
(3) As an oscillator (4) As a voltage regulator

43. Zener breakdown will occur if- **[RPMT-2001]**
(1) Impurity level is low (2) Impurity level is high
(3) Impurity is less in n-side (4) Impurity is less in p-side

44. In the given fig. which of the diodes are foward biased- **[Kerala PET-2002]**



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

45. If the forward voltage in a diode is increased, the width of the depletion region- **[AMUCET-2001, Manipal-2002]**
(1) Decreases (2) Increases (3) Fluctuates (4) does not change

46. Consider the following statements A and B and identify the correct answer- **[EAMCET-2003]**
[A] A zener diode is always connected in reverse bias.
[B] The potential barrier of a P-N junction lies between 0.1 to 0.3 V 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

47. Function of rectifier is **[AFMC 2002, 04]**
(1) To convert ac into dc (2) To convert dc into ac
(3) Both (1) and (2) (4) None of these

48. The cause of the potential barrier in a p-n diode is : **[AIPMT-1998]**
(1) depletion of positive charges near the junction
(2) concentration of positive charges near the junction
(3) depletion of negative charges near the junction
(4) concentration of positive and negative charges near the junction

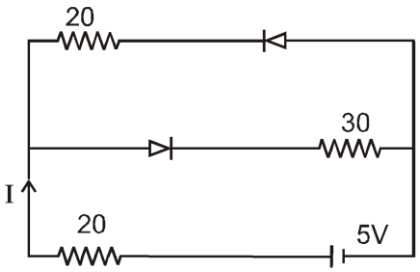
49. A semi-conducting device is connected in a series in circuit with a battery and a resistance. A current is allowed to pass through the circuit. If the polarity of the battery is reversed, the current drops to almost zero. The device may be : **[AIPMT-1998]**
(1) a p-n junction (2) an intrinsic semiconductor
(3) a p-type semiconductor (4) an n-type semiconductor

50. In a junction diode, the holes are due to : **[AIPMT-1999]**
(1) protons (2) extra electrons (3) neutrons (4) missing electrons

51. Depletion layer consists of : **[AIPMT-1999]**
(1) electrons (2) protons (3) mobile charge carriers (4) immobile ions

52. In forward bias the width of depletion layer in a p-n junction diode : **[AIPMT-1999]**
(1) increases (2) decreases
(3) remains constant (4) first increases then decreases

53. The current (I) in the circuit will be :- **[AIPMT-2001]**



(1) $\frac{5}{40}$ A (2) $\frac{5}{50}$ A (3) $\frac{5}{10}$ A (4) $\frac{5}{20}$ A

54. In a P-N junction diode not connected to any circuit- **[AIPMT-2002]**
(1) High potential at N side and low potential at P side
(2) High potential at P side and low potential at N side
(3) P and N both are at same potential
(4) Potentials of N side and P side are undetermined

55. In a PN junction :- **[AIPMT-2002]**
(1) High potential at N side and low potential at P side
(2) High potential at N side and low potential at N side
(3) P and N both are at same potential
(4) Undetermined

56. Reverse bias applied to a junction diode- **[AIPMT-2003]**
(1) Lowers the potential barrier (2) Raises the potential barrier
(3) Increases the majority carrier current (4) Decreases the minority carrier current

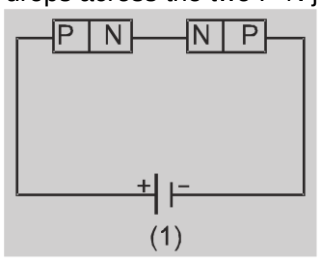
57. Barrier potential of a p-n junction diode does not depend on- **[AIPMT-2003]**
(1) Diode design (2) Temperature (3) Forward bias (4) Doping density

58. The inverse saturation current in a P-N junction diode at 27°C is 10_{-5} amp. The value of forward current at 0.2 volt will be- ($e_{7.62}$ = 2038.6)
(1) 2037.6 × 10_{-3} A (2) 203.76 × 10_{-3} A (3) 20.376 × 10_{-3} A (4) 2.0376 × 10_{-3} A

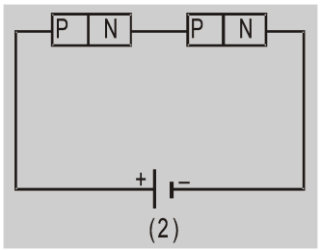
59. Reason for potential barrier in p-n junction is : **[RPMT-2001]**
(1) excess of positive charge at junction
(2) deficiency of positive charge at junction
(3) deficiency of negative charge at junction
(4) excess of positive and negative charge at junction

60. In p-n junction depletion region decreases when : **[RPMT-2002]**
(1) zero bias (2) forward bias (3) reverse bias (4) temperature decreases

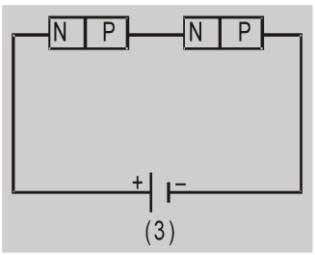
61. Two identical P-N junction may be connected in series with a battery in three ways (fig below). The potential drops across the two P-N junction are equal in-



(1)



(2)

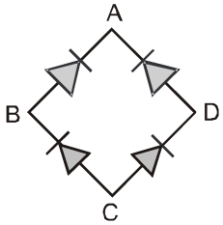


(3)

(1) Circuit 1 and 2 (2) Circuit 2 and 3 (3) Circuit 3 and 1 (4) Circuit 1 only

62. In a P-N junction diode which is not connected to any circuit-
(1) Potential is the same every where
(2) The P-type side is at a higher potential than the N-type side
(3) There is an electric field at the junction directed from the N-type side to the P-type side
(4) There is an electric field at the junction directed from the P-type side to the N-type side

63. For the given circuit shown in fig, to act as full wave rectifier, a.c. input should be connected across .....and.....the d.c. output would appear across.....and.....



(1) A, C and B, D (2) B, D and A, C (3) A, B and C, D (4) C, A and D, B

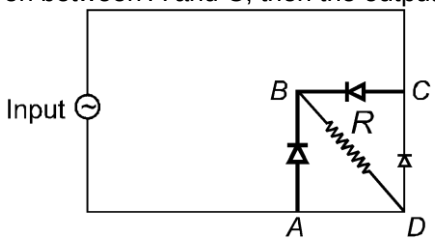
64. In a.....biased P-N junction the net flow holes is from N-region to the P-region-
(1) forward bias (2) reverse bias (3) no (4) both 1 and 2

65. For making p-n junction diode forward biased : **[RPMT-2004]**
(1) same potential is applied (2) greater potential is given to n compared to p
(3) greater potential is given to p compared to n (4) unbalanced concentration

66. When a p-n junction diode is reverse biased, then **[RPMT-2007]**
(1) no current flows (2) the depletion region is increased
(3) the depletion region is reduced (4) the height of the potential barrier is reduced

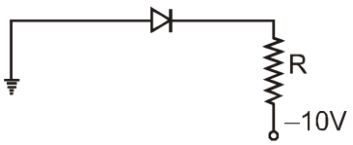
67. In the middle of the depletion layer of reverse biased p - n juction, the **[RPMT-2008]**
(1) electric field is zero (2) potential is maximum
(3) electric field is maximum (4) Potential is zero

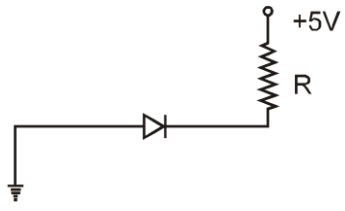
68. If the input is given between A and C, then the output at the ends of R will be **[RPMT-2009]**

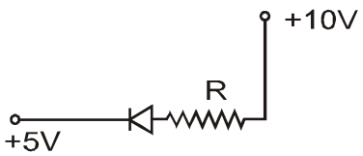


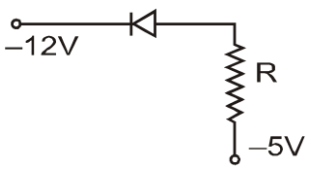
(1) fully rectified (2) half rectified (3) AC (4) None of these

69. Of the diodes shown in the following diagrams, which one of the diode is reverse biased ? **[AIPMT-2004]**

(1)


(2)


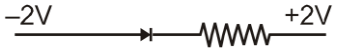
(3)


(4)


70. Application of a forward bias to a p-n junction – **[AIPMT- 2005]**
(1) Widens the depletion zone
(2) Increases the number of donors on the n side
(3) Increases the potential difference across the depletion zone
(4) Increases the electric field in the depletion zone

71. A frorward biased diode is :- **[AIPMT-2006]**
(1) 

(2) 

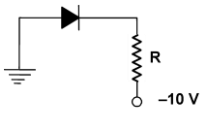
(3) 

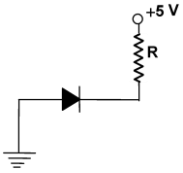
(4) 

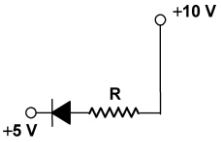
72. A p-n photodiode is made of a material with a band gap of 2.0 eV. The minimum frequency of the radiation that can be absorbed by the material is nearly **[AIPMT-2008]**
(1) $10 \times 10_{14}$ Hz (2) $5 \times 10_{14}$ Hz (3) $1 \times 10_{14}$ Hz (4) $20 \times 10_{14}$ Hz

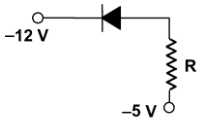
73. When P-N junction diode is forward biased, then- **[AIEEE-2004]**
(1) the depletion region is reduced and barrier height is increased.
(2) the depletion region is widened and barrier height is reduced.
(3) both the depletion region and barrier height are reduced.
(4) both the depletion region and barrier height are increased.

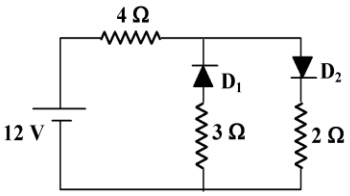
74. In a full wave rectifier circuit operating from 50 Hz mains frequency, the fundamental frequency in the ripple would be : **[AIEEE-2005]**
(1) 50 Hz (2) 25 Hz (3) 100 Hz (4) 70.7 Hz

75. In the following, which one of the diodes is reverse biased? **[AIEEE 2006]**
(1) 

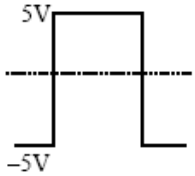
(2) 

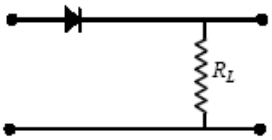
(3) 

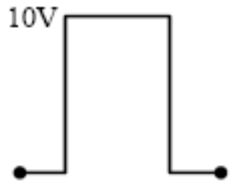
(4) 

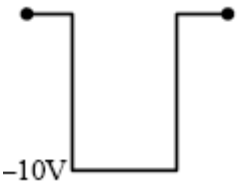
76. The circuit has two oppositely connected ideal diodes in parallel. What is the current flowing in the circuit? **[AIEEE 2006]**


(1) 2.31 A (2) 1.33 A (3) 1.71 A (4) 2.00 A

77. If in p-n junction diode, a square input signal of 10 V is applied as shown. Then the output signal across *R* will be **[AIEEE 2007]**




(1) 

(2) 

(3) 

(4) 

78. The drift current in a p-n junction is
(1) from the n-side to the p-side
(2) from the p-side to the n-side
(3) from the n-side to the p-side if the junction is forward-baised and in the opposite direction if it is reverse-biased
(4) from the p-side to the n-side if the junction is forward-biased and in the opposite direction if it is reverse-baised

79. The diffusion current in a p-n junction is
(1) from the n-side to the p-side
(2) from the p-side to the n-side
(3) from the n-side to the p-side of the junction is forward-biased and in the opposit direction if it is reverse-baised
(4) from the p-side to the n-side if the junction is forward-baised and in the opposite direction if it is reverse-biased

80. A semiconducting device is connected in a series circuit with a battery and a resistance. A current is found to pass through the circuit. If the polarity of the battery is reversed, the current drops to almost zero. The device may be
(1) an intrinsic semiconductor (2) a p-type semiconductor
(3) an n-type semiconductor (4) a p-n junction

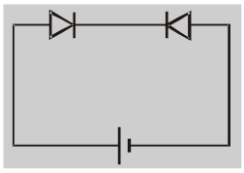
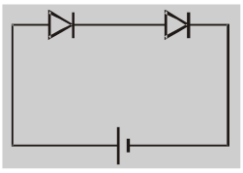
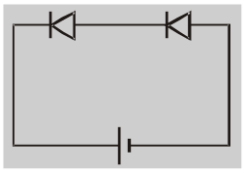
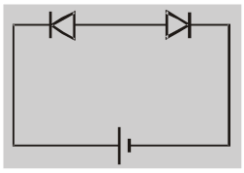
81. If the two ends P and N of a P-N of a P-N diode junction are joined by a wire **[MP PMT 2002]**
(1) There will not be a steady current in the circuit
(2) There will be a steady current from N side to P side
(3) There will be a steady current from P side to N side
(4) There may not be a current depending upon the resistance of the connecting wire

82. To make a PN junction conducting **[IIT-JEE 1994]**
(1) The value of forward bias should be more than the barrier potenital
(2) The value of forward bias should be less than the barrier potential
(3) The value of revers bias should be more than the barrier potential
(4) The value of revers bias should be less than the barrier potential

83. Zener diode is used as **[CBSE PMT 1999]**
(1) Half wave rectifer (2) Full wave rectifier (3) ac voltage stabilizer (4) dc voltage stabilizer

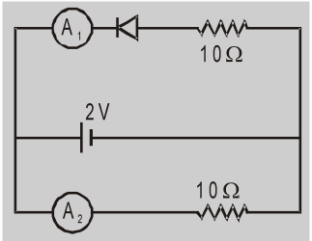
84. In P-N junction, the barrier potential offers resistance to **[AMU 1995, 96]**
(1) Free electrons in N region and holes in P region
(2) Free electrons in P region and holes in N region
(3) Only free electrons in N region
(4) Only holes in P region

85. Two identical P-N diodes are connected in series in the following ways. Maximum current will flow in circuit-

[A]  [B]  [C]  [D] 

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

86. In the following circuit readings in ammeters A_1 and A_2 will be-



(1) 0.2 A, zero (2) Zero, 0.2 A (3) 0.2 A, 0.2 A (4) 0.2 A, 0.4 A

87. A light emitting diode has a voltage drop of 2 v across it and passes a current of 10 μA. when it operates with a 6 v battery through a limiting resistor R, the value of R is **[RPMT-2007]**
(1) 40 kΩ (2) 4 kΩ (3) 200 kΩ (4) 400 kΩ

SECTION (C) : TRANSISTORS

1. An amplifier is nothing but an oscillator with – **[CPMT-1993]**
(1) positive feedback (2) high gain (3) no feed back (4) negative feed back

2. In a normal operation of a tranistor,
(1) the base-emitter junction is forward-biased (2) the base-collector junction is forward-biased
(3) the base-emitter junction is reverse-baised (4) the base-collector junction is reverse-baised

3. In the case of constants α and β of a transistor **[CET 2003]**
(1) α = β (2) β < 1 α > 1 (3) αβ = 1 (4) β > 1 α < 1

4. If α = 0.98 and current through emitter i_e = 20 mA, the value of β is **[DPMT 2002]**
(1) 4.9 (2) 49 (3) 96 (4) 9.6

5. The transfer ratio B of a transistor is 50. the input resistance of the transistor when used in the common emitter configuration is 1 kΩ. The peak value of the collector AC current for an AC input voltage of 0.01 V peak is : **[AIPMT-1998]**
(1) 100 μA (2) 0.01 mA (3) 0.25 mA (4) 500 μA

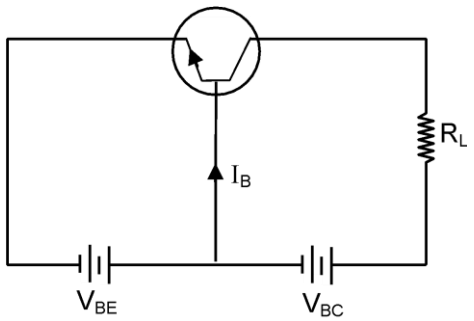
6. For a common emmiter circuit if $\frac{I_C}{I_E}$ = 0.98 then current gain for common emitter circuit will be : **[AIPMT-2001]**
(1) 49 (2) 98 (3) 4.9 (4) 25.5

7. A n-p-n transistor conducts when **[AIPMT-2003]**
(1) both collector and emitter are positive with respect to the base
(2) collector is positive and emitter is negative with respect to the base
(3) collector is positive and emitter is at same potential as the base
(4) both collector and emitter are negative with respect to the base

8. A transistor (pnp or npn) can be used as
(1) an amplifier (2) an oscillator (3) a switch (4) All of these

9. The part of a transistor which is most heavily doped to produce large number of majority charge carries is : **[AIEEE-2002]**
(1) emitter (2) base
(3) collector (4) can be any of the above three

10. In a common-base configuration of transistor. α = 0.98, I_B = 0.02 mA, R_L = 5 kΩ. Output voltage across load is :

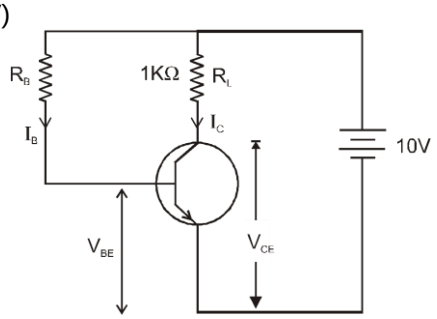


(1) 3.2 V (2) 4.9 V (3) 5.2 V (4) 6.2 V

11. The minimum potential difference between the base and emitter required to switch a silicon transistor 'ON' is approximately ? **[RPMT-2007]**

(1) 1 V (2) 3 V (3) 5 V (4) 4.2 V

12. In the circuit shown in figure, the current gain β = 100 for a npn transistor. The bias resistance R_B so that V_{CE} = 5V is (V_{BE} << 10 V)



(1) $2 \times 10^3\ \Omega$ (2) $10^5\ \Omega$ (3) $2 \times 10^5\ \Omega$ (4) $5 \times 10^5\ \Omega$

13. In a common emitter amplifier using output resistance of 5000 ohm and input resistance of 2000 ohm, if the peak value of input signal voltage is 10 mV and β = 50 then the calculated power gain will be **[RPMT-2014]**

(1) 6.25×10^3 (2) 1.4 (3) 62.5 (4) 2.5×10^4

14. A transistor-oscillator using a resonant circuit with an inductor L (of negligible resistance) and a capacitor C in series produce oscillations of frequency. If L is doubled and C is changed to 4C, the frequency will be : **[AIPMT-2006]**

(1) $\frac{f}{4}$ (2) 8 f (3) $\frac{f}{2\sqrt{2}}$ (4) $\frac{f}{2}$

15. A transistor is operated in common emitter configuartion at constant collectr veltage V_c = 1.5 V such that a change in the base current from 100 μA to 150 μA produces a change in the collectro current from 5 mA to 10 mA. The current gain (β) is :- **[AIPMT-2006]**

(1) 67 (2) 75 (3) 100 (4) 50

16. A common emitter amplifier has a voltage gain of 50 and current gain is 25. The power gain of the amplifier is : **[AIPMT-2007]**

(1) 500 (2) 1000 (3) 1250 (4) 100

17. When npn transistor is used as an amplifier: **[AIEEE-2004]**

(1) electrons move from base to collector (2) holes move from emitter to base
(3) electrons move from collector to base (4) holes move from base to emitter

18. In a common base amplifier, the phase difference between the input signal voltage and output voltage is : **[AIEEE-2005]**

(1) $\frac{\pi}{4}$ (2) π (3) zero (4) $\frac{\pi}{2}$

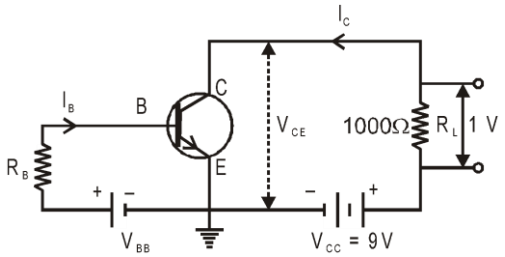
19. In a common–base of mode of transistor, the collector current is 5.488 mA for an emitter current of 5.60 mA. The value of the base current amplification factor (β) will be : **[AIEEE 2006]**

(1) 49 (2) 50 (3) 51 (4) 48

20. A working transistor with its three legs marked P, Q and R is tested using a multimeter. No conduction is found between P and Q. By connecting the common (negative) terminal of the multimeter to R and the other (positive) terminal to P or Q, some resistance is seen on the multimeter. Which of following is true for the transistor ? [**AIEEE 2008]**

(1) It is a pnp transistor with R as collector (2) It is a pnp transistor with R as emitter
(3) It is an npn transistor with R as collector (4) It is an npn transistor with R as base

21. An N-P-N transistor is connected in common emitter configuration in which collector supply is 9V and the voltage drop across the load resistance of 1000Ω connected in the collector circuit is 1 V. If current amplification factor is (25/26), if the internal resistance of the transistor is 200Ω, then which of the following options is **incorrect**.



(1) V_{CE} = 8 V (2) collector current is 1.0 mA

(3) voltage gain $\frac{50}{23}$, and power gain is 4.6 (4) emitter current is 2.04 mA

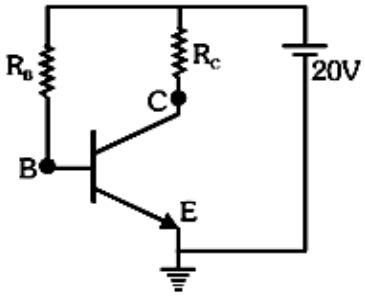
22. In a common emitter (CE) amplifier having a voltage gain G, the transistor used has transconductance 0.03 mho and current gain 25. If the above transistor is replaced with another one with transconductance 0.02 mho and current gain 20, the voltage gain will be : **[NEET-2013]**

(1) 1.5 G (2) $\frac{1}{3}$ G (3) $\frac{5}{4}$ G (4) $\frac{2}{3}$ G

23. The input resistance of a silicon transistor is 100 Ω. Base current is changed by 40 μA which results in a change in collector current by 2mA. This transistor is used as a common emitter amplifier with a load resistance of 4 KΩ. The voltage gain of the amplifier is :

(1) 2000 (2) 3000 (3) 4000 (4) 1000

24. For given CE biasing circuit, if voltage across collector-emitter is 12V and current gain is 100 and base current is 0.04 mA then determine the value collector resistance R_C.



(1) 1200Ω (2) 200Ω (3) 400Ω (4) 2000Ω

25 The A-C current gain of a transistor is β= 19. In its common-emitter configuration, What will be the change in the emitter current for a change of 0.4 mA in the base-current ?

(1) 7.6 mA (2) 7.2 mA (3) 8 mA (4) 6.8 mA

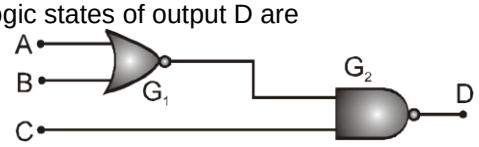
SECTION (D) : LOGIC GATES

1. The truth table shown in figure is for **[Pb CET 1998]**

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

(1) XOR (2) AND (3) XNOR (4) OR

2. For the given combination of gates, if the logic states of inputs A, B, C are as follows A = B = C = 0 and A = B = 1, C = 0 then the logic states of output D are



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

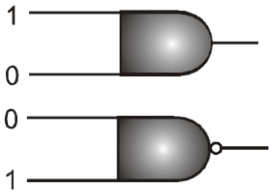
3. A gate has the following truth table **[CBSE PMT 2000]**

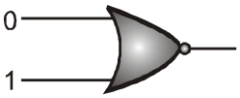
P	1	1	0	0
Q	1	0	1	0
R	1	0	0	0

The gate is

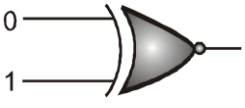
(1) NOR (2) OR (3) NAND (4) AND

4. Which of the following gates will have an output of 1 **[CBSE PMT 1998]**

(1) 

(2) 

(3)

(4) 

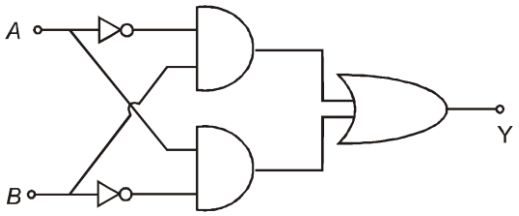
5. If A and B are two inputs in AND gate, then AND gate has an output of 1 when the values of A and B are **[INPCEE 2002]**

(1) A = 0, B = 0 (2) A = 1, B = 1 (3) A = 1, B = 0 (4) A = 0, B = 1

6. The Boolean equation of NOR gate is **[Haryana CET 2002]**

(1) C = A + B (2) $C = \overline{A + B}$ (3) C = A.B (4) $C = \overline{A.B}$

7. The following circuit represents : **[AIPMT-1999]**



(1) OR gate (2) XOR gate (3) AND gate (4) NAND gate

8. Following truth table represent which logic gate – **[AIPMT-2001]**

A	`B	C
1	1	0
0	1	1
1	0	1
0	0	1

(1) XOR (2) NOT (3) NAND (4) AND

9. The given truth table is for which logic gate :- **[AIPMT-2002]**

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

(1) NAND (2) XOR (3) NOR (4) OR

10. The truth table **[RPMT-2011]**

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

is of the

(1) NAND gate (2) OR gate (3) NOT gate (4) AND gate

11. Zener dode is used for :- **[AIPMT- 2005]**

(1) Rectification (2) Stabilisation

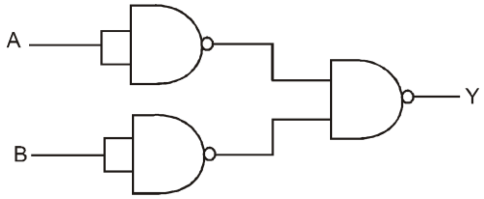
(3) Amplification (4) producing oscillations in an oscillator

12. The output of OR gate is 1 :- **[AIPMT-2004]**

(1) If either or both inputs are 1 (2) Only if both inputs are 1

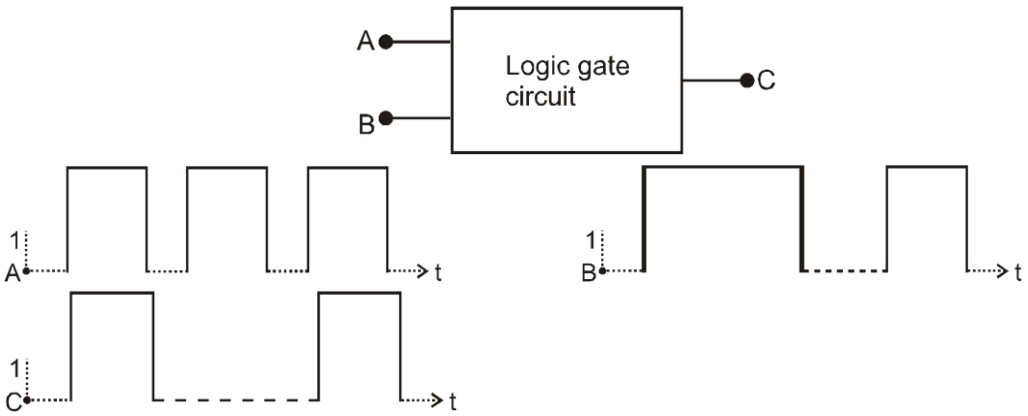
(3) If either input is zero (4) If both inputs are zero

13. Name the type of gate used in the circuit given, find the relation between A, B and Y and draw the truth table. **[AIPMT-2005]**



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

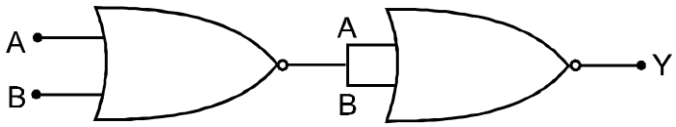
14. The following figure shows a logic gate circuit with tow inputs A and B and the output C. The voltage wavefroms of A, B and C are as shown below - **[AIPMT-2006]**



The logic circuit gate is :-

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

15. In the following circuit, the output Y for all possible inputs A and B is expressed by the truth table: **[AIPMT-2007]**



(1)

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

(2)

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

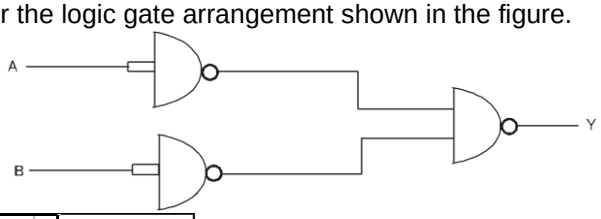
(3)

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

(4)

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

16. Draw the truth table for the logic gate arrangement shown in the figure. **[AIPMT (Mains) 2007]**

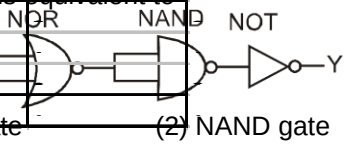


Input		output
A	B	Y = A + B
0	0	0
0	1	1
1	0	1
1	1	1

(1) (2)

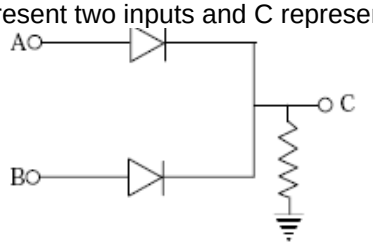
(3) (4)

17. The circuit is equivalent to **[AIPMT-2008]**



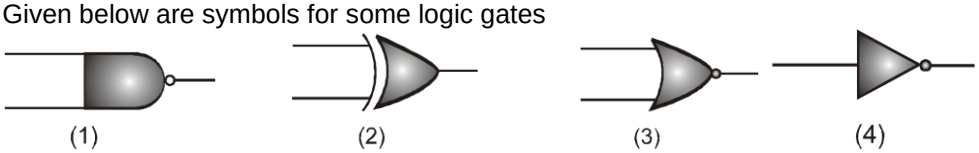
(1) AND gate (2) NAND gate (3) NOR gate (4) OR gate

18. In the circuit below, A and B represent two inputs and C represents the output. **[AIEEE 2008]**



The circuit represents
(1) AND gate (2) NAND gate (3) OR gate (4) NOR gate

19. Given below are symbols for some logic gates



(1) (2) (3) (4)

The XOR gate and NOR gate respectively are **[AFMC 1994]**
(1) 1 and 2 (2) 2 and 3 (3) 3 and 4 (4) 1 and 4

20. The following truth table corresponds to the logic gate **[BHU 1994; CPMT 2000; J & K CET 2004]**

A	0	0	1	1
B	0	1	0	1
X	0	1	1	1

(1) NAND (2) OR (3) AND (4) XOR

21. A truth able is given below. Which of the following has this type of truth table **[CBSE PMT 1996; UPSEAT 2002]**

A	0	1	0	1
B	0	0	1	1
y	1	0	0	0

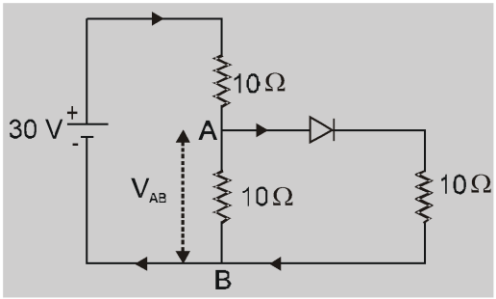
(1) XOR gate (2) NOR gate (3) AND gate (4) OR gate

22. An AND gate can be prepared by repetitive use of
(1) NOT gate (2) OR gate (3) NAND gate (4) NOR gate

Exercise-2

ONLY ONE OPTION CORRECT TYPE

1. For given circuit potential difference V_{AB} is- **[RPMT-2000]**

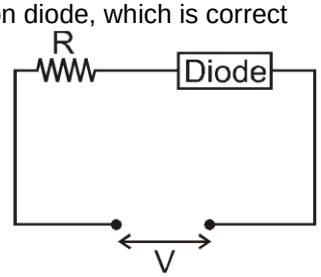


(1) 10 V (2) 20 V (3) 30 V (4) None

2. The resistance of a discharge tube is : **[AIPMT-1999]**
(1) zero (2) ohmic (3) non-ohmic (4) infinity

3. For a transistor $\frac{I_C}{I_E}$ = 0.96, then current gain for common emitter configuration : **[AIPMT-2002]**
(1) 12 (2) 6 (3) 48 (4) 24

4. For the given circuit of P-N junction diode, which is correct **[AIPMT-2002]**



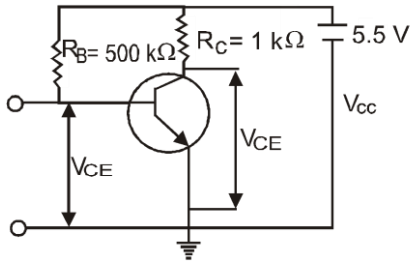
(1) In F.B. the voltage across R is V (2) In R.B. the voltage across R is V
(3) In F.B. the voltage across R is 2 V (4) In R.B. the voltage across R is 2 V

5. A sinusoidal voltage of peak to peak value of 310 V is connected in series with a diode and a load resistance R so that Half-wave rectification occurs. If the diode has a negligble forwed resistance, the root mean square voltage across the load resistance is **[RPMT-2014]**
(1) 310 V (2) 155 V (3) 109.5 V (4) 77.5

6. A photo-cell employs photoelectric effect to convert **[AIPMT-2006]**
(1) Change in the frequency of light into a change in electric voltage
(2) Change in the intensity of illumination into a change in photoelectric current
(3) Change in the intensity of illumination into a change in the work function of the phoitocathode
(4) Change in the frequency of light into a change inthe electric current

7. Semiconductor Ge has forbidden gap of 1.43 eV. Calculate maximum wavelength which result from electron hole combination. **[AIPMT-2006]**
(1) 8654 Å (2) 7650 Å (3) 4982 Å (4) 10500 Å

8. (a) For given transistor circuit, the base current is 10 μA and the collector current is 5.2 mA. Can this transistor circuit be used as an amplifier. Your answer must be supported with proper explanation. **[AIPMT-2008]**



(b) For a common emitter amplifier, current gain is 69. If the emitter current is 7 mA then calculate the base current and collector current.

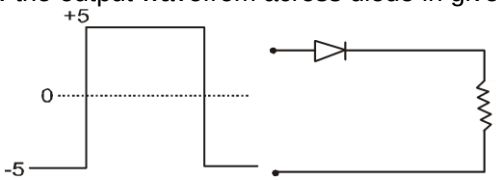
Exercise-3

PART - I : NEET / AIPMT QUESTION (PREVIOUS YEARS)

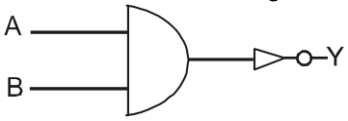
1. A p-n photodiode is fabricated from a semiconductor with a band gap of 2.5 eV. It can detect a signal of wavelength **[AIPMT-2009]**
(1) 6000 Å (2) 4000 nm (3) 6000 nm (4) 4000 Å

2. The symbolic representation of four logic gates **[AIPMT-2009]**
(i) 
(ii) 
(iii) 
(iv) 
The logic symbol for OR, NOT and NAND gates are respectively
(1) (iii) , (iv), (ii) (2) (iv) , (i), (iii) (3) (iv) , (ii), (i) (4) (i) , (iii), (iv)

3. (a) Draw the circuit diagram of reversed bias p-n junction. **[AIPMT-2009]**
(b) Draw the output wavefrom across diode in given circuit.



(c) Draw the truth table for the given logic gate.

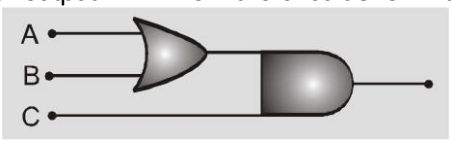


4. Which one of the following statement is false? **[AIPMT-2010]**
(1) Pure Si doped with trivalent impurities gives a p-type semiconductor.
(2) Majority carriers in a n-type semiconductor are holes.
(3) Minority carriers in a p-type semiconductor are electrons.
(4) The resistance of intrinisic semiconductor decreases with increase of temperature.

5. The device that act as a complete electronic circuit is **[AIPMT-2010]**
(1) junction diode (2) integrated circuit (3) junction transistor (4) zener diode

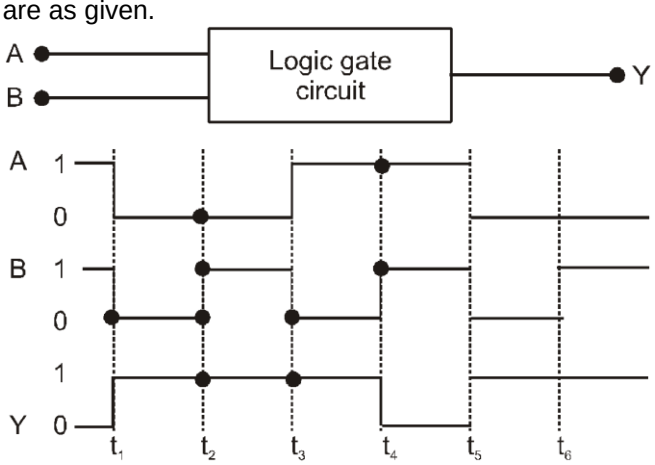
6. A common emitter amplifier has a voltage gain of 50, an input impedance of 100 Ω and an output impedance of 200 Ω. The power gain of the amplifier is **[AIPMT-2010]**
(1) 500 (2) 1000 (3) 1250 (4) 50

7. To get an output Y = 1 from the circuit shown below the input must be **[AIPMT-2010]**



	A	B	C
(1)	0	1	0
(2)	0	0	1
(3)	1	0	1
(4)	1	0	0

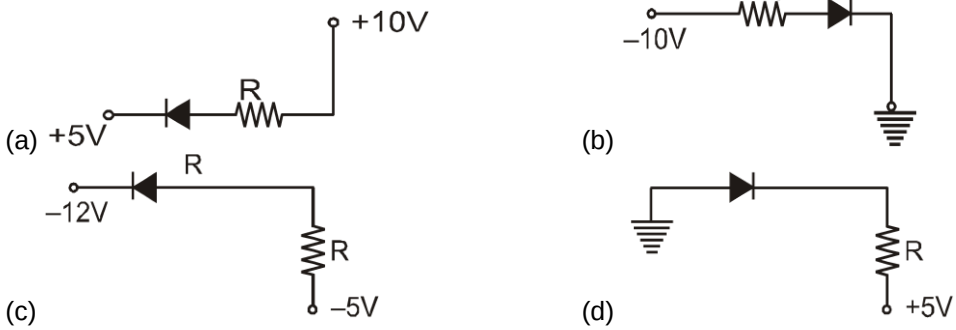
8. Two following figure shows a logic gate circuit with two inputs A and B and the output Y. the voltage wave forms of A, B and Y are as given. **[AIPMT-2010]**



The logic gate is

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

9. In the following figure, the diodes which are forward biased, are : **[AIPMT 2011]**

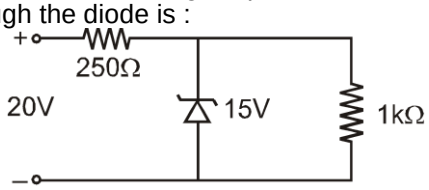


(1) (c) only (2) (c) and (a) (3) (b) and (d) (4) (a), (b) and (d)

10. Pure Si at 500K has equal number of electron (n_e) and hole (n_h) concentrations of 1.5×10^{16} m^{-3}. Doping by indium increases n_h to 4.5×10^{22} m^{-3}. The doped semiconductor is of : **[AIPMT 2011]**

(1) n–type with electron concentration $n_e = 5 \times 10^{22}$ m^{-3}
(2) p–type with electron concentration $n_e = 2.5 \times 10^{10}$ m^{-3}
(3) n–type with electron concentration $n_e = 2.5 \times 10^{23}$ m^{-3}
(4) p–type having electron concentrations $n_e = 5 \times 10^{9}$ m^{-3}

11. A zener diode, having breakdown voltage equal to 15V, is used in a voltage regulator circuit shown in figure. The current through the diode is : **[AIPMT 2011]**



(1) 10 mA (2) 15 mA (3) 20 mA (4) 5 mA

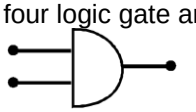
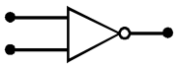
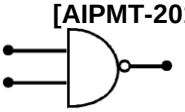
12. A transistor is operated in common emitter configuration at $V_C = 2V$ such that a change in the base current from 100 μA to 300 μA produces a change in the collector current from 10 mA to 20 mA. The current gain is: **[AIPMT-2011]**

(1) 50 (2) 75 (3) 100 (4) 25

13. In forward biasing of the p–n junction : **[AIPMT-2011]**

(1) the positive terminal of the battery is connected to p–side and the depletion region becomes thick
(2) the positive terminal of the battery is connected to n–side and the depletion region becomes thin
(3) the positive terminal of the battery is connected to n–side and the depletion region becomes thick
(4) the positive terminal of the battery is connected to p–side and the depletion region becomes thin

14. Symbolic representation of four logic gate are shown as : **[AIPMT-2011]**

(i)  (ii)  (iii)  (iv) 

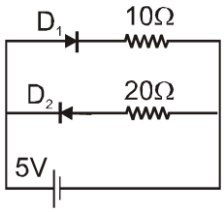
Pick out which ones are for AND, NAND and NOT gates, respectively :

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

15. If a small amount of pentavalent atoms is added to germanium crystal : **[AIPMT-2011]**

(1) It becomes a p–type semiconductor
(2) the antimony becomes an acceptor atom
(3) there will be more free electrons than holes in the semiconductor
(4) its resistance is increased

16. Two ideal diodes are connected to a battery as shown in the circuit. The current supplied by the battery is : **[AIPMT_Pre_2012]**



(1) 0.75 A (2) zero (3) 0.25 A (4) 0.5 A

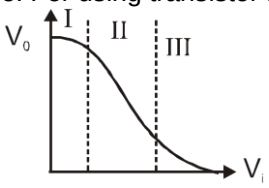
17. In a CE transistor amplifier, the audio signal voltage across the collector resistance of 2k Ω is 2V. If the base resistance is 1kΩ and the current amplification of the transistor is 100, the input signal voltage is : **[AIPMT_Pre_2012]**

(1) 0.1 V (2) 1.0 V (3) 1mV (4) 10mV

18. C and Si both have same lattice structure, having 4 bonding electrons in each. However, C is insulator where as Si is intrinsic semiconductor. This is because : **[AIPMT_Pre_2012]**

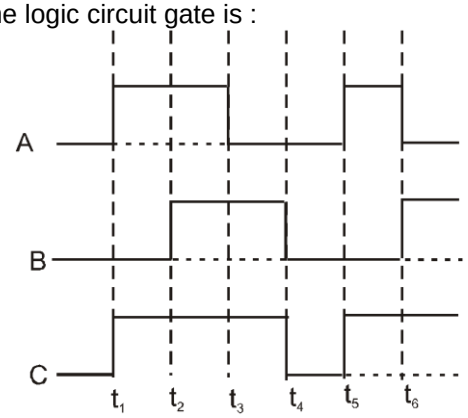
(1) In case of C the valence band is not completely filled at absolute zero temperature.
(2) In case of C the conduction band is partly filled even at absolute zero temperature.
(3) The four bonding electrons in the case of C lie in the second orbit, whereas in the case of Si they lie in the third.
(4) The four bonding electrons in the case of C lie in the third orbit, whereas for Si they lie in the fourth orbit.

19. Transfer characteristics [output voltage (V_0) vs input voltage (V_i)] for a base biased transistor in CE configuration is as shown in the figure. For using transistor as a switch, it is used : **[AIPMT_Pre_2012]**



(1) in region III (2) both in region (I) and (III)
(3) in region II (4) in region I

20. The figure shows a logic circuit with two inputs A and B and the output C. The voltage wave forms across A, B and C are as given. The logic circuit gate is : **[AIPMT_Pre_2012]**

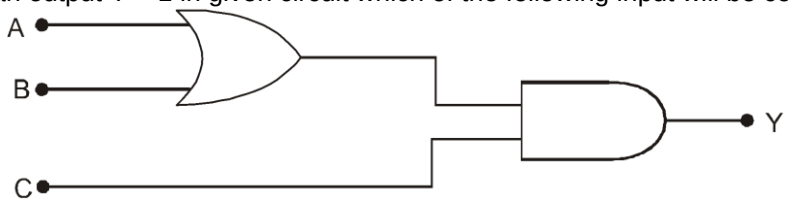


(1) OR gate (2) NOR gate (3) AND gate (4) NAND gate

21. The input resistance of a silicon transistor is 100 Ω. Base current is changed by 40 μA which results in a change in collector current by 2mA. This transistor is used as a common emitter amplifier with a load resistance of 4 KΩ. The voltage gain of the amplifier is : **[AIPMT 2012 (Mains)]**

(1) 2000 (2) 3000 (3) 4000 (4) 1000

22. To get an output Y = 1 in given circuit which of the following input will be correct :**[AIPMT 2012 (Mains)]**



	A	B	C
(1)	1	0	0
(2)	1	0	1
(3)	1	1	0
(4)	0	1	0

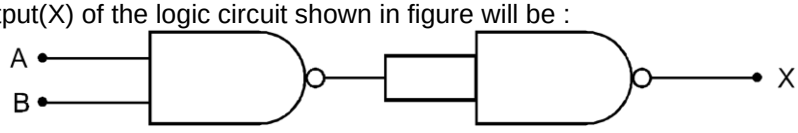
23. In a n-type semiconductor, which of the following statement is true : **[NEET-2013]**

(1) Electron are minority carriers and pentavalent atoms are dopants.
(2) Holes are minority carriers and pentavalent atoms are dopants.
(3) Holes are majority carriers and trivalent atoms are dopants.
(4) Electrons are majority carriers and trivalent atoms are dopants.

24. In a common emitter (CE) amplifier having a voltage gain G, the transistor used has transconductance 0.03 mho and current gain 25. If the above transistor is replaced with another one with transconductance 0.02 mho and current gain 20, the voltage gain will be : **[NEET-2013]**

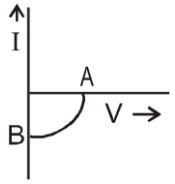
(1) 1.5 G (2) $\frac{1}{3}G$ (3) $\frac{5}{4}G$ (4) $\frac{2}{3}G$

25. The output(X) of the logic circuit shown in figure will be : **[NEET_2013]**



(1) $X = \overline{A \cdot B}$ (2) $X = A \cdot B$ (3) $X = \overline{A + B}$ (4) $X = \bar{A} , \bar{B}$

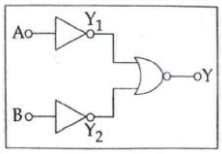
26. The given graph represents V – I characteristic for a semiconductor device. **[AIPMT-2014]**



Which of the following statement is correct ?
(1) It is V – I characteristic for solar cell where, point A represents open circuit voltage and point B short circuit current.
(2) It is for a solar cell and points A and B represent open circuit voltage and current, respectively.
(3) It is for a photodiode and points A and B represent open circuit voltage and current respectively.
(4) It is for a LED and points A and B represent open circuit voltage and short circuit current, respectively.

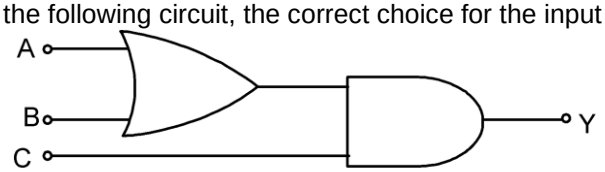
27. The barrier potential of a p-n junction depends on : **[AIPMT-2014]**
(a) type of semi conductor material
(b) amount of doping
(c) temperature
Which one of the following is correct?
(1) (a) and (b) only (2) (b) only (3) (b) and (c) only (4) (a), (b) and (c)

28. Which logic gate is represented by the following combination of logic gate? **[AIPMT-2015]**



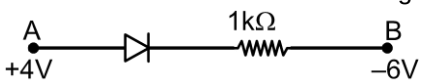
(1) NAND (2) AND (3) NOR (4) OR

29. To get output 1 for the following circuit, the correct choice for the input is : **[AIPMT-2016]**



(1) A = 1, B = 0, C = 1 (2) A = 0, B = 1, C = 0
(3) A = 1, B = 0, C = 0 (4) A = 1, B = 1, C = 0

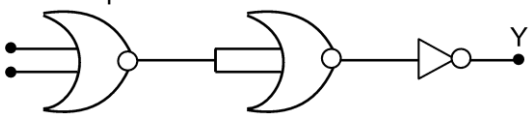
30. Consider the junction diode as ideal. The value of current flowing through AB is : **[AIPMT_2016]**



(1) 10_{-3} A (2) 0 A (3) 10_{-2} A (4) 10_{-1} A

31. A npn transistor is connected in common emittet configuration in a given amplifier. A load resistance of 800 Ω is connected in the collector circuit and the voltage drop across it is 0.8 V. If the current amplification factor is 0.96 and the input resistance of the circuit is 192Ω, the voltage gain and the power gain of the amplifier will respectively be : **[AIPMT-2016]**
(1) 4,3.69 (2) 4,3.84 (3) 3.69, 3.84 (4) 4, 4

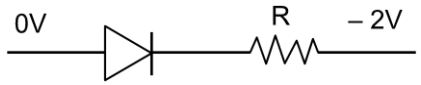
32. The given electrical network is equivalent to

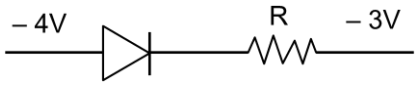


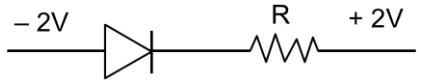
(1) AND gate (2) OR gate (3) NOR gate (4) NOT gate

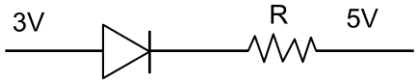
33. In a common emitter transistor amplifier the audio signal voltage across the collector is 3V. The resistance of collector is 3 kΩ. If current gain is 100 and the base resistance is 2kΩ, the voltage and power gain of the amplifier is : **[NEET 2017]**
(1) 200 and 1000 (2) 15 and 200 (3) 150 and 15000 (4) 20 and 2000

34. Which one of the following represents forward bias diode? **[NEET-2017]**

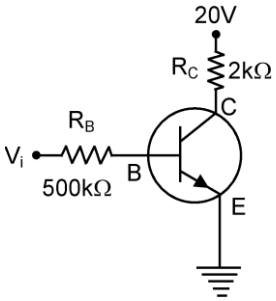
(1) 

(2) 

(3) 

(4) 

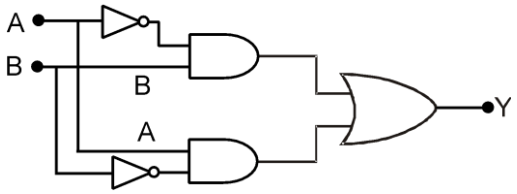
35. In the circuit shown in the figure, the input voltage V_i is 20 V, V_{BE} = 0 and V_{CE} = 0. The values of I_B, I_C and β are given by **[NEET 2018]**



(1) I_B = 40 μA, I_C = 10 mA, β = 250
(2) I_B = 40 μA, I_C = 5 mA, β = 125
(3) I_B = 20 μA, I_C = 5 mA, β = 250
(4) I_B = 25 μA, I_C = 5 mA, β = 200

36. In a p-n junction diode, change in temperature due to heating **[NEET 2018]**
(1) affects only reverse resistance
(2) affects the overall V – I characteristics of p-n junction
(3) does not affect resistance of p-n junction
(4) affects only forward resistance

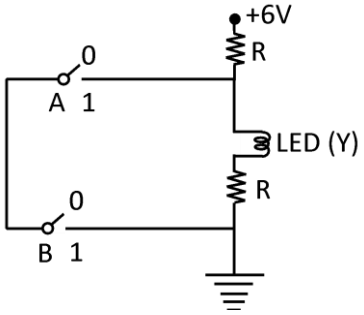
37. In the combination of the following gates the output Y can be written in terms of inputs A and B as **[NEET-2018]**



(1) $\overline{A.B}$ (2) $\overline{A+B}$ (3) $\overline{A.B}+A.B$ (4) $A.\bar{B}+\bar{A}.B$

38. For a p-type semiconductor, which of the following statements is true? **[NEET 2019-I]**
(1) Electrons are the majority carriers and pentavalent atoms are the dopants.
(2) Electrons are the majority carriers and trivalent atoms are the dopants.
(3) Holes are the majority carriers and trivalent atoms are the dopants.
(4) Holes are the majority carriers and pentavalent atoms are the dopants.

39. The correct Boolean operation represented by the circuit diagram drawn is : **[NEET 2019-I]**

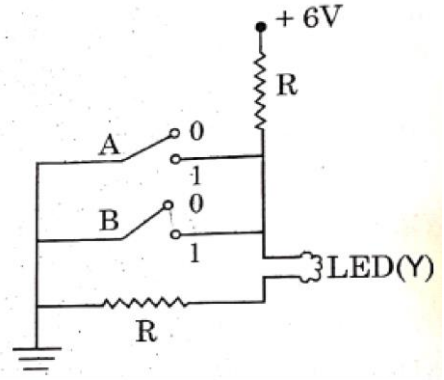


(1) NOR (2) AND (3) OR (4) NAND

40. An LED is constructed from a p-n junction diode using GaAsP. The energy gap is 1.9 eV. The wavelength of the light emitted will be equal to **[NEET 2019-II]**

(1) 10.4×10^{-26} m (2) 654 nm (3) 654 Å (4) 654×10^{-11} m

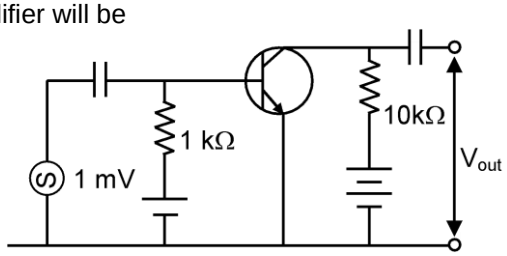
41. The circuit diagram shown here corresponds to the logic gate, **[NEET 2019-II]**



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

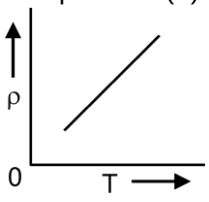
PART - II : AIIMS QUESTION (PREVIOUS YEARS)

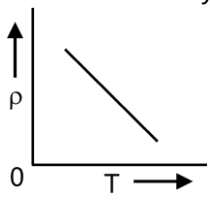
1. In the following common emitter configuration an npn transistor with current gain β = 100 is used. The output voltage of the amplifier will be

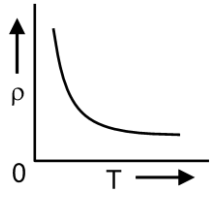


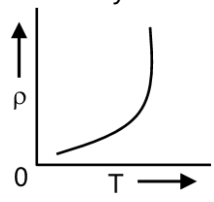
(1) 10 mV (2) 0.1 V (3) 1.0 V (4) 10 V

2. The temperature (T) dependence of resistivity (ρ) of a semiconductor is represented by

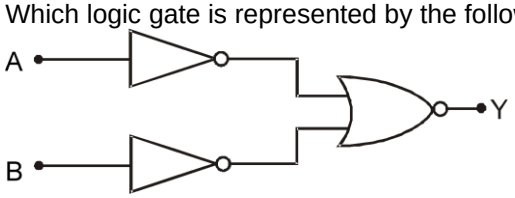
(1) 

(2) 

(3) 

(4) 

3. Which logic gate is represented by the following combination of logic gates?



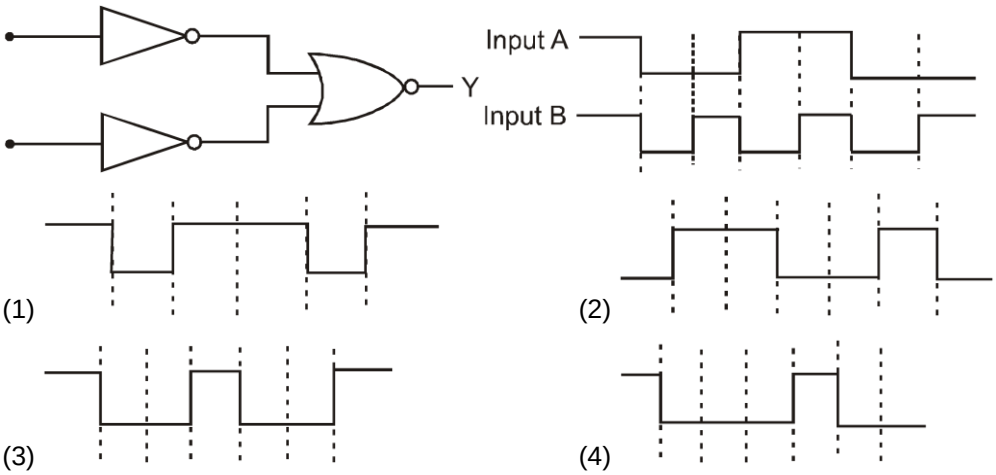
(1) OR (2) NAND (3) AND (4) NOR

4. A transistor connected at common emitter mode contains load resistance of 5 kΩ and an input resistance of 1 kΩ. If the input peak voltage is 5 mV and the current gain is 50, find the voltage gain.

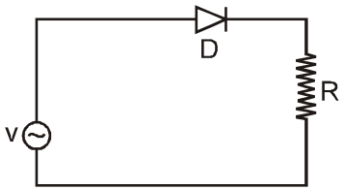
(1) 250 (2) 500 (3) 125 (4) 50

PART - III : JEE (MAIN) / AIEEE PROBLEMS (PREVIOUS YEARS)

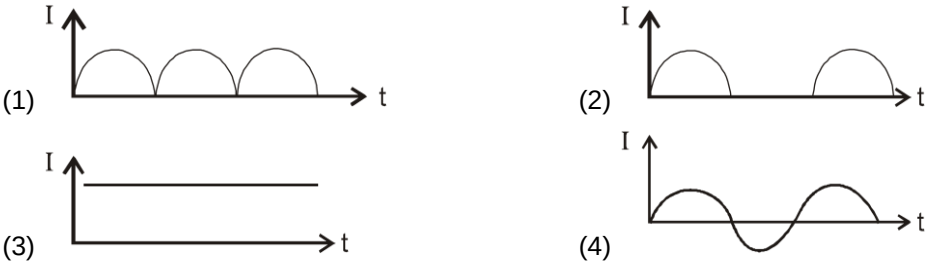
1. The logic circuit shown below has the input waveforms 'A' and 'B' as shown. Pick out the correct out put waveform. **[AIEEE 2009]**



2. A p-n junction (D) shown in the figure can act as a rectifier. An alternating current source (V) is connected in the circuit. **[AIEEE 2009]**



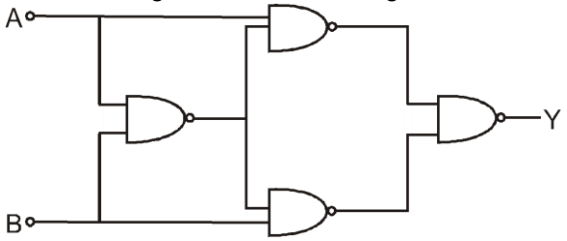
The current (I) in the resistor (R) can be shown by:



3. The output of an OR gate is connected to both the inputs of a NAND gate. The combination will serve as a : **[AIEEE 2011, 11 May; 4, –1]**

(1) NOT gate (2) NOR gate (3) AND gate (4) OR gate

4. Truth table for system of four NAND gates as shown in figure is : **[AIEEE 2012 ; 4, –1]**



(1)

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

(2)

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

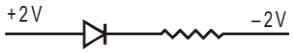
(3)

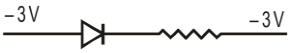
A	B	Y
0	0	1
0	1	1
1	0	0
1	1	0

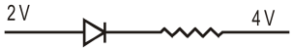
(4)

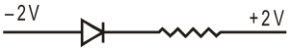
A	B	Y
0	0	1
0	1	0
1	0	0
1	1	1

5. The forward biased diode connection is **[JEE-Mains 2014]**

(1) 

(2) 

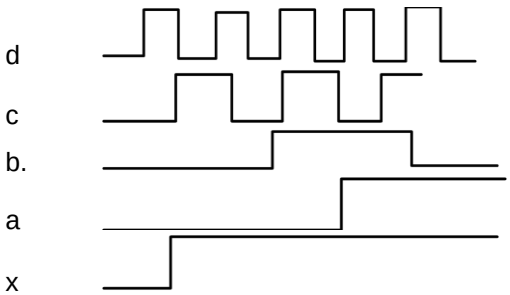
(3) 

(4) 

6. The temperature dependence of resistances of Cu and undoped Si in the temperature range 300 – 400 K, is best described by : **[JEE-MAIN 2016 ; 4/120. –1]**

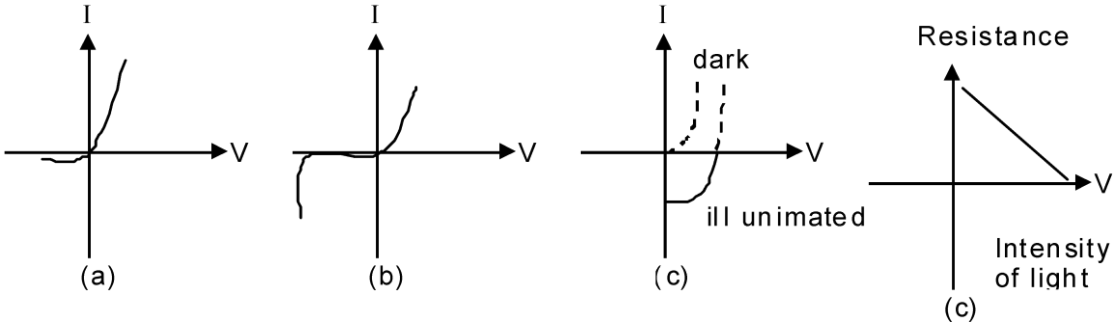
(1) Linear increase for Cu, exponential increase for Si
(2) Linear increase for Cu, exponential decrease for Si
(3) Linear decrease for Cu, linear decrease for Si
(4) Linear increase for Cu, linear increase for Si

7. If a,b,c,d are inputs to a gate and x is its output, then, as per the following time graph, the gate is : **[JEE-MAIN 2016 ; 4/120. –1]**



(1) AND (2) OR (3) NAND (4) NOT

8. Identify the semiconductor devices whose characteristics are given below, in the order (a),(b),(c),(d) **[JEE-MAIN 2016 ; 4/120. –1]**



(1) zener diode, simple diode, Light dependent resistance, Solar cell
(2) Solar cell , Light dependent resistance, Zener diode, simple diode
(3) Zener diode, Solar cell, Simple diode, Light dependent resistance
(4) Simple diode, Zener diode, Solar cell, Light dependent resistance.

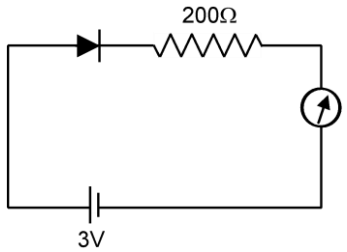
9. For a common emitter configuration, if α and β have their usual meanings, the **incorrect** relationship between α and β is. **[JEE-MAIN 2016 ; 4/120. –1]**

(1) $\alpha = \frac{\beta}{1-\beta}$ (2) $\alpha = \frac{\beta}{1+\beta}$ (3) $\alpha = \frac{\beta^2}{1+\beta^2}$ (4) $\frac{1}{\alpha} = \frac{1}{\beta} + 1$

10. In a common emitter amplifier circuit using an n-p-n transistor, the phase difference between the input and the output voltages will be: **[JEE Main 2017]**

(1) 180° (2) 45° (3) 90° (4) 135°

11. The reading of the ammeter for a silicon diode in the given circuit is : **[JEE-Main-2018]**

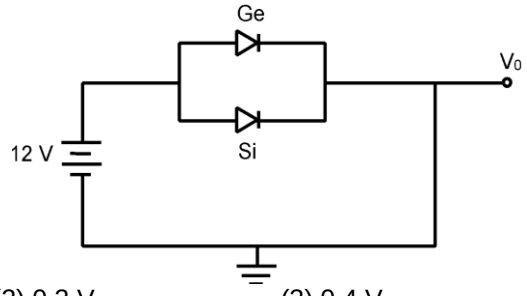


(1) 11.5mA (2) 13.5 mA (3) 0 (4) 15 mA

12. Mobility of electrons in semiconductor is defined as the ratio of their drift velocity to the applied electric field. If, for an n-type semiconductor, the density of electrons is 10^{19} m^{-3} and their mobility is 1.6 $m^2/(V.s)$ then the resistivity of the semiconductor (since it is an n-type semiconductor (since it is an n-type semiconductor contribution of holes is ignored) is close to : **[JEE-Main-2019]**

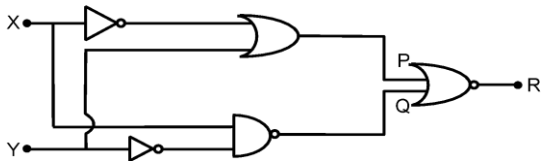
(1) 4 Ωm (2) 0.4 Ωm (3) 0.2 Ωm (4) 2 Ωm

13. Ge and Si diodes start conducting at 0.3 V and 0.7 V respectively. In the following figure if Ge diode connection are reversed, the value of V_0 changes by : (assume that the Ge diode has large breakdown voltage) **[JEE-Main-2019]**



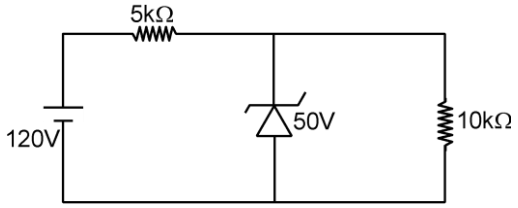
(1) 0.6 V (2) 0.2 V (3) 0.4 V (4) 0.8 V

14. To get output '1' at R, for the given logic gate circuit the input values must be : **[JEE-Main-2019]**



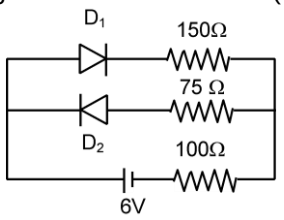
(1) X = 1, Y = 1 (2) X = 0, Y = 0 (3) X = 0, Y = 1 (4) X = 1, Y = 0

15. For the circuit shown below, the current through the Zener diode is: **[JEE-Main-2019]**



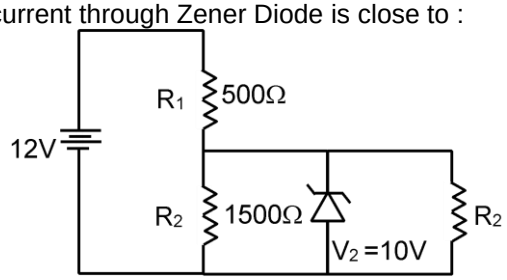
(1) 14 mA (2) 9 mA (3) zero (4) 5 mA

16. The circuit shown below contains two ideal diodes, each with a forward resistance of 50Ω. If battery voltage is 6 V, the current through the 100Ω resistance (in Amperes) is : **[JEE-Main-2019]**



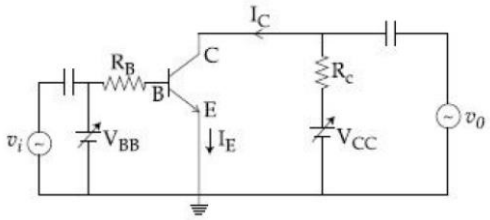
(1) 0.020 (2) 0.030 (3) 0.027 (4) 0.036

17. In the given circuit the current through Zener Diode is close to : **[JEE-Main-2019]**



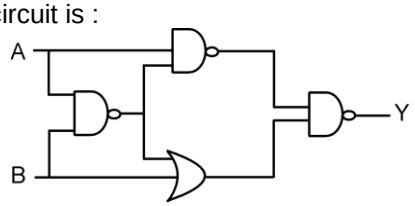
(1) 0.0 mA (2) 6.7 mA (3) 6.0 mA (4) 4.0 mA

18. In the figure, given that V_{BB} supply can vary from 0 to 5.0 V, V_{CC} = 5V, β_{dc} = 200, R_B = 100 kΩ, R_C = 1 kΩ and V_{BE} = 1.0 V. The minimum base current and the input voltage at which the transistor will go to saturation, will be, respectively : **[JEE-Main-2019]**



(1) 25 μA and 2.8 V (2) 20 μA and 3.5 V (3) 20 μA and 2.8 V (4) 25 μA and 3.5 V

19. The output of the given logic circuit is : **[JEE-Main-2019]**



(1) $A\bar{B} + \bar{A}B$ (2) $\bar{A}B$ (3) $A\bar{B}$ (4) $AB + \overline{AB}$

Answers

EXERCISE # 1

SECTION (A) :

1.	(3)	**2.**	(2)	**3.**	(4)	**4.**	(3)	**5.**	(2)	**6.**	(4)	**7.**	(2)
8.	(1)	**9.**	(3)	**10.**	(1,2,3,4)	**11.**	(2,3)	**12.**	(1)	**13.**	(3)	**14.**	(1)
15.	(1)	**16.**	(1)	**17.**	(2)	**18.**	(2)	**19.**	(1)	**20.**	(2)	**21.**	(3)
22.	(3)	**23.**	(3)	**24.**	(3)	**25.**	(2)	**26.**	(4)	**27.**	(4)	**28.**	(1)
29.	(3)	**30.**	(2)	**31.**	(2)	**32.**	(4)	**33.**	(4)	**34.**	(4)	**35.**	(2)
36.	(1)	**37.**	(3)	**38.**	(3)	**39.**	(3)	**40.**	(3)	**41.**	(4)	**42.**	(2)
43.	(3)	**44.**	(3)	**45.**	(4)	**46.**	(4)						

SECTION (B) :

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

SECTION (C) :

1.	(1)	**2.**	(1,4)	**3.**	(4)	**4.**	(2)	**5.**	(4)	**6.**	(1)	**7.**	(2)
8.	(4)	**9.**	(1)	**10.**	(2)	**11.**	(1)	**12.**	(3)	**13.**	(1)	**14.**	(3)
15.	(3)	**16.**	(3)	**17.**	(4)	**18.**	(3)	**19.**	(1)	**20.**	(4)	**21.**	(3)
22.	(4)	**23.**	(1)	**24.**	(4)	**25**	(3)						

SECTION (D) :

1.	(3)	**2.**	(4)	**3.**	(4)	**4.**	(3)	**5.**	(2)	**6.**	(2)	**7.**	(2)
8.	(3)	**9.**	(1)	**10.**	(1)	**11.**	(2)	**12.**	(1)	**13.**	(4)	**14.**	(1)
15.	(4)	**16.**	(1)	**17.**	(3)	**18.**	(3)	**19.**	(2)	**20.**	(2)	**21.**	(2)
22.	(3,4)												

EXERCISE # 2

1.	(1)	**2.**	(3)	**3.**	(4)	**4.**	(1)	**5.**	(4)	**6.**	(2)	**7.**	(1)

8. (a) Yes, $\beta = 520$ (b) $i_b = 0.1$ mA, $i_c = 6.9$ Ma

EXERCISE # 3

PART - I

1.	(4)	**2.**	(3)	**4.**	(2)	**5.**	(2)	**6.**	(3)	**7.**	(3)	**8.**	(4)
9.	(2)	**10.**	(4)	**11.**	(4)	**12.**	(1)	**13.**	(4)	**14.**	(4)	**15.**	(3)
16.	(4)	**17.**	(4)	**18.**	(3)	**19.**	(2)	**20.**	(1)	**21.**	(1)	**22.**	(2)
23.	(2)	**24.**	(4)	**25.**	(2)	**26.**	(1)	**27.**	(4)	**28.**	(2)	**29.**	(1)
30.	(3)	**31.**	(2)	**32.**	(3)	**33.**	(3)	**34.**	(1)	**35.**	(2)	**36.**	(2)
37.	(4)	**38.**	(3)	**39.**	(4)	**40.**	(2)	**41.**	(1)				

PART - II

1.	(3)	**2.**	(3)	**3.**	(3)	**4.**	(1)

PART - III

1.	(4)	**2.**	(2)	**3.**	(2)	**4.**	(1)	**5.**	(1)	**6.**	(2)	**7.**	(2)
8.	(4)	**9.**	(1,3)	**10.**	(1)	**11.**	(1)	**12.**	(2)	**13.**	(3)	**14.**	(4)
15.	(2)	**16.**	(1)	**17.**	(1)	**18.**	(4)	**19.**	(3)				