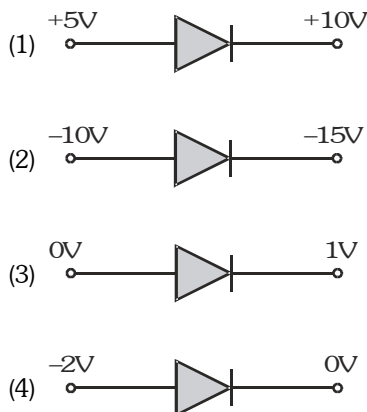


CHECK YOUR GRASP
ELECTRONICS
EXERCISE-I
SEMI CONDUCTOR - ELECTRONICS

1. In semiconductor the valence band at 0 K is
 - (1) completely filled (2) completely empty
 - (3) partially filled (4) nothing can be said
2. Cu and Ge are cooled to 70 K then :-
 - (1) the resistance of Cu will decrease and that of Ge will decrease
 - (2) the resistance of Cu will decrease and that of Ge will increase
 - (3) the resistance of both Cu and Ge decrease
 - (4) the resistance of both Cu and Ge increase
3. If number of holes and free electrons in semiconductor are n_p and n_e respectively then :-
 - (1) $n_p > n_e$ in intrinsic semiconductor
 - (2) $n_p = n_e$ in extrinsic semiconductor
 - (3) $n_p = n_e$ in intrinsic semiconductor
 - (4) $n_e > n_p$ in intrinsic semiconductor
4. The resistivity of a semiconductor depends upon its
 - (1) size (2) type of atoms
 - (3) length (4) size and type of atom
5. The forbidden energy gap in Ge is :-
 - (1) 0.72 eV (2) 0.072 eV
 - (3) 7.2 eV (4) 0.0072 eV
6. The energy gap in a semiconductor is of the order of :-
 - (1) 1 eV (2) 5 eV (3) 10 eV (4) 15 eV
7. P type semi conductor is :-
 - (1) positively charged
 - (2) made by mixing of impurity of boron in germanium
 - (3) made by mixing of impurity of phosphorus in silicon.
 - (4) made by mixing of impurity of carbon in silicon
8. The depletion region of a p-n junction contains :-
 - (1) electrons only
 - (2) electrons and holes both
 - (3) holes only
 - (4) neither electrons nor holes
9. The p-n junction is a :-
 - (1) ohmic resistance (2) non ohmic resistance
 - (3) positive resistance (4) negative resistance
10. When the value of current increases in p-n junction, then contact potential
 - (1) decreases
 - (2) increases
 - (3) remains unchanged
 - (4) depends on temperature
11. p-n junction is called as forward biased when
 - (1) positive terminal of the battery is connected to the p-type semiconductor and negative terminal is connected to the n-type semiconductor
 - (2) positive terminal of battery is connected to the n-type semiconductor and negative terminal is connected to the p-type semiconductor
 - (3) positive terminal of battery is connected to either p or n-type of semiconductor
 - (4) a mechanical force is applied in forward direction
12. When a p-n junction is reversed biased, then the current through the junction is mainly due to :-
 - (1) diffusion of charge
 - (2) nature of the material
 - (3) drift of the charges
 - (4) both drift and diffusion of the charges
13. The thinnest part of a transistor is :-
 - (1) emitter
 - (2) base
 - (3) collector
 - (4) according to transistor parameters none of these
14. In transistor symbols, the arrows shows the direction of :-
 - (1) current in the emitter
 - (2) electron current in the emitter
 - (3) holes current in the emitter
 - (4) electron current in the emitter
15. Transistor can be used as :-
 - (1) amplifier (2) modulator
 - (3) oscillator (4) all of the above
16. A device whose one end is connected to -ve terminal and the other is connected to +ve terminal, if both ends are interchanged with supply then current is not flowing then device will be :-
 - (1) p-n junction (2) transistor
 - (3) zener diode (4) triode
17. A common Emitter circuit is used as an amplifier, whose current gain is 50. If input resistance is $1\text{ k}\Omega$ and input voltage is 5 volt then output current will be :-
 - (1) 250 mA (2) 30 mA
 - (3) 50 mA (4) 100 mA

18. In which case is the junction diode is not reverse bias :-



19. For transistor current relation is :-

(1) $\alpha = \frac{\beta}{1 - \beta}$ (2) $\beta = \frac{\alpha}{1 - \alpha}$

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

20. In a full wave rectifier if input freq. is 50 Hz then output ripple frequency will be :-

(1) 50 Hz (2) 100 Hz (3) 200 Hz (4) 25 Hz

21. The ratio of resistance for forward to reverse bias of P-N junction diode is :-

(1) $10^2 : 1$ (2) $10^{-2} : 1$ (3) $1 : 10^{-4}$ (4) $1 : 10^4$

22. If the forward voltage in a diode is increased, the width of the depletion region :-

(1) decreases (2) increases
(3) fluctuates (4) does not change

23. In a n-p-n transistor circuit, the collector current is 10 mA. If 90% of the electrons emitted reach the collector, the emitter current (I_E) and base current (I_B) are given by

(1) $I_E = 1 \text{ mA}$; $I_B = 11 \text{ mA}$
 (2) $I_E = 11 \text{ mA}$; $I_B = 1 \text{ mA}$
 (3) $I_E = -1 \text{ mA}$; $I_B = 9 \text{ mA}$
 (4) $I_E = 9 \text{ mA}$; $I_B = -1 \text{ mA}$

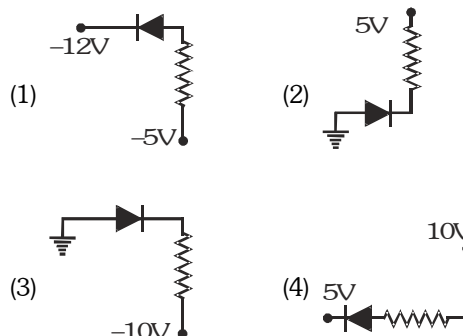
24. An n-p-n transistor conducts when :-

(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

25. For pure "Ge" semiconductor quantity of "e" and hole is 10^{19} e/m^3 if we doped donor impurity in it with density 10^{23} e/m^3 then quantity of hole (e/m^3) in semiconductor is :-

(1) 10^{15} (2) 10^{19} (3) 10^{23} (4) 10^{27}

26. In given diagram which p-n junction is reverse biased



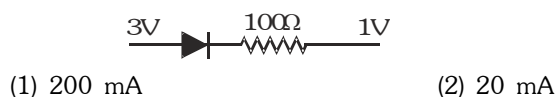
27. In a p-n junction the depletion layer of thickness 10^{-6} m has potential across it is 0.1 V. The electric field is (V/m) :-

(1) 10^7 (2) 10^{-6} (3) 10^5 (4) 10^{-5}

28. A Ge specimen is doped with Al. The concentration of acceptor atoms is $\sim 10^{21} \text{ atoms/m}^3$. Given that the intrinsic concentration of electron-hole pairs is $\sim 10^{19} \text{ /m}^3$, the concentration of electrons in the specimen is :-

(1) 10^{17} /m^3 (2) 10^{15} /m^3
 (3) 10^4 /m^3 (4) 10^2 /m^3

29. Assuming that the junction diode is ideal the current through the diode is :-

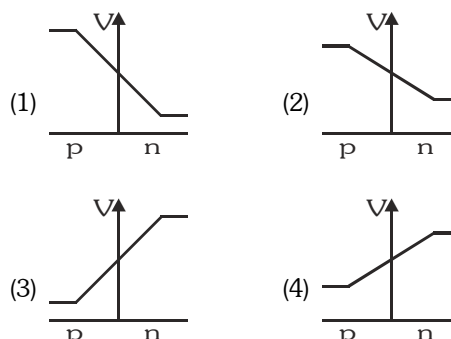


(3) 2 mA (4) zero

30. When two semiconductor of p and n type are brought in to contact, they form a p-n junction which acts like a :-

(1) rectifier (2) amplifier
(3) oscillator (4) conductor

31. In a forward biased p-n junction diode, the potential barrier in the depletion region is of the form :-



32. In CB configuration of transistor ac current gain is

$\frac{\Delta i_C}{\Delta i_E} = 0.98$, determine current gain of CE configuration :-

- (1) 49 (2) 98 (3) 4.9 (4) 24.5

33. For given transistor $\alpha = \frac{I_C}{I_E} = 0.96$ current gain of CE is :-

- (1) 6 (2) 12 (3) 24 (4) 48

34. A transistor has an $\alpha = 0.95$ it has change in emitter current of 100 milli-ampere, then the change in collector current is :-

- (1) 95 mA (2) 99.05 mA
(3) 0.95 mA (4) 100 mA

35. For a transistor $I_E = 25$ mA and $I_B = 1$ mA. The value of current gain α will be :-

- (1) $\frac{25}{24}$ (2) $\frac{24}{25}$ (3) $\frac{25}{26}$ (4) $\frac{26}{25}$

LOGIC GATES

36. In Boolean algebra $Y = A + B$ implies that

- (1) output Y exists when both input A and B exist
(2) output Y exists when either input A exists or input B exists or both inputs A and B exist
(3) output Y exists when either input A exists or input B exists but not when both inputs A and B exist.
(4) output Y exists when both inputs A and B exist but not when either input A or B exists.

37. Which of the following gate corresponds to the truth table given below :-

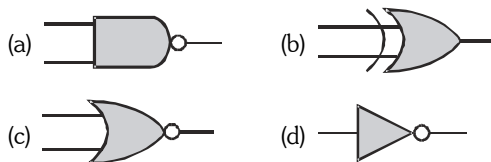
- (1) NAND
(2) AND
(3) XOR
(4) OR

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

38. In the Boolean algebra $\overline{A} \cdot \overline{B}$ equals :-

- (1) $A + B$ (2) $\overline{A + B}$ (3) $A \cdot B$ (4) $\overline{A \cdot B}$

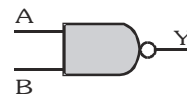
39. Given below are symbols for some logic gates :-



The XOR gate and NOR gate respectively are :-

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

40. The symbol represents :-



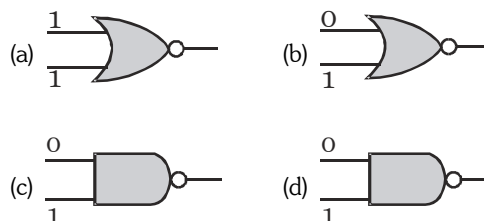
- (1) NAND gate (2) OR gate
(3) AND gate (4) NOR gate

41. The truth table shown below is for which of the following gate :-

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

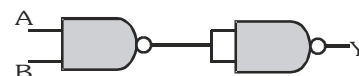
- (1) AND
(2) NAND
(3) XOR
(4) NOR

42. Which of the following gates will have an output of 1 :-



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

43. Following circuit performs the logic function of :-



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

44. How many minimum NAND gates are required to obtain NOR gate :-

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

45. The logic behind 'NOR' gate is that it gives

- (1) high output when both inputs are high
(2) high output when both inputs are low
(3) low output when both inputs are low
(4) none of these

46. Logic gates are the building blocks of a :-

- (1) abacus system (2) analog system
(3) digital system (4) none of these

47. Given truth table is related with :-

- (1) NOT Gate
(2) OR Gate
(3) XOR Gate
(4) NAND Gate

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

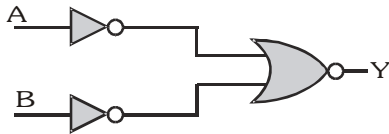
48. The truth table given above is for which of the following gates :-

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

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

49. Which logic gate is represented by the following combination of logic gate :-

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



50. The truth table given below belongs for which gates

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

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

51. Out of the following, universal gate is :-

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

52. The truth table given below is for :-

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

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

53. The output of gate is low when at least one of its input is high. This is true for :-

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

54. An XOR gate produces an output only when its two inputs are :-

- (1) same (2) different (3) low (4) high

55. In Boolean algebra, which of the following is not equal to zero :-

- (1) $A \cdot \bar{A}$ (2) $A \cdot 0$ (3) $\overline{A + A}$ (4) $\overline{\bar{A} \cdot 0}$

56. Digital circuits can be made by repetitive use of :-

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

57. When all the inputs of a NAND gate are connected together, the resulting circuit is :-

- (1) a NOT gate (2) an AND gate
(3) an OR gate (4) a NOR gate

58. Which of the following pairs are universal gates

- (1) NAND, NOT (2) NAND, AND
(3) NOR, OR (4) NAND, NOR

59. The output of a two input NOR gate is in state 1 when :-

- (1) either input terminals is at 0 state
(2) either input terminals is at 1 state
(3) both input terminals are at 0 state
(4) both input terminals are at 1 state

PRINCIPLES OF COMMUNICATION SYSTEM

60. Modulation is not used to :-

- (1) Reduce the bandwidth used
(2) Separate the transmissions of different users
(3) Ensure that intelligence may be transmitted to long distances
(4) Allow the use of practical antennas

61. AM is used for broadcasting because :-

- (1) It is more noise immune than other modulation systems
(2) It requires less transmitting power compared with other systems
(3) Its use avoids transmitter complexity
(4) No other modulation system can provide the necessary bandwidth faithful transmission

62. Frequencies in the UHF range normally propagate by means of :-

- (1) Ground waves (2) Sky waves
(3) Surface waves (4) Space waves

63. Digital signals (i) do not provide a continuous set of values, (ii) represent values as discrete steps, (iii) can utilize only binary system, and (iv) can utilize decimal as well as binary system. Which of the following options is True :

- (1) Only (i) and (ii) (2) Only (ii) and (iii)
(3) (i), (ii) and (iii), but not (iv)
(4) All the above (i) to (iv)

64. An 'antenna' is :-
 (1) Inductive
 (2) Capacitative
 (3) Resistive above its resonance frequency
 (4) None of the above
65. Long distance short-wave radio broad-casting uses :-
 (1) Ground wave (2) Ionospheric wave
 (3) Direct wave (4) Sky wave
66. The power in a two-wire transmission line travels :-
 (1) Inside the conductors
 (2) Outside the conductors
 (3) None of the above
 (4) Both inside and outside the conductors
67. For television broadcasting, the frequency employed is normally :-
 (1) 30 – 300 M Hz (2) 30 – 300 G Hz
 (3) 30 – 300 K Hz (4) 30 – 300 Hz
68. The sound waves after being converted into electrical waves are not transmitted as such because
 (1) They travel with the speed of sound
 (2) The frequency is not constant
 (3) They are heavily absorbed by the atmosphere
 (4) The height of antenna has to be increased several times
69. The process of superimposing signal frequency (i.e. audio wave) on the carrier wave is known as
 (1) Transmission (2) Reception
 (3) Modulation (4) Detection
70. In an amplitude modulated wave for audio-frequency of 500 cycles/second, the appropriate carrier frequency will be :-
 (1) 50 cycles/sec. (2) 100 cycles/sec.
 (3) 500 cycles/sec (4) 50,000 cycles/sec.
71. If there were no atmosphere, the average temperature on the surface of earth would be:-
 (1) Lower (2) Higher
 (3) Same as now (4) 0°C
72. The T.V. transmission tower in Delhi has a height of 240 m. the distance up to which the broadcast can be received, (taking the radius of earth to be 6.4×10^6 m) is :-
 (1) 100 km (2) 60 km
 (3) 55 km (4) 50 km
73. Radio waves of constant amplitude can be generated with :-
 (1) Filter (2) Rectifier
 (3) FET (4) Oscillator
74. The maximum distance upto which TV transmission from a TV tower of height h can be received is proportional to :-
 (1) $h^{1/2}$ (2) h (3) $h^{3/2}$ (4) h^2
75. In short wave communication waves of which of the following frequencies will be reflected back by the ionospheric layer having electron density 10^{11} per m^{-3} ?
 (1) 2 MHz (2) 10 MHz (3) 12 MHz (4) 18 MHz
76. For skywave propagation of a 10 MHz signal, what should be the minimum electron density in ionosphere –
 (1) $\sim 1.2 \times 10^{12} m^{-3}$ (2) $\sim 10^6 m^{-3}$
 (3) $\sim 10^{14} m^{-3}$ (4) $\sim 10^{22} m^{-3}$
77. Audio signal cannot be transmitted because :-
 (1) The signal has more noise
 (2) The signal cannot be amplified for distance communication
 (3) The transmitting antenna length is very small to design
 (4) The transmitting antenna length is very large and impracticable

78. In frequency modulation :-

- (1) The amplitude of carrier wave varies according to the frequency of message signal
- (2) The frequency of carrier wave varies according to the amplitude of message signal
- (3) The frequency of carrier wave varies according to the frequency of message signal
- (4) The amplitude of carrier wave varies according to the amplitude of message signal

79. Range of frequencies allotted for commercial FM radio broadcast is :-

- (1) 88 to 108 MHz
- (2) 88 to 108 kHz
- (3) 8 to 88 MHz
- (4) 88 to 108 GHz

80. Sound produced by a tuning fork is a sort of :-

- (1) digital signal (2) analog signal
- (3) both (1) and (2) (4) neither (1) nor (2)

81. The space waves which are affected seriously by atmospheric conditions are :-

- (1) MF (2) HUF (3) VHF (4) UHF

82. Which of the following is not transducer ?

- (1) Loudspeaker (2) Amplifier
- (3) Microphone (4) All the these

83. An antenna is of height 500 m. What will be its range (Radius of the earth is 6400 km) ?

- (1) 800 km (2) 100 km
- (3) 50 km (4) 80 km

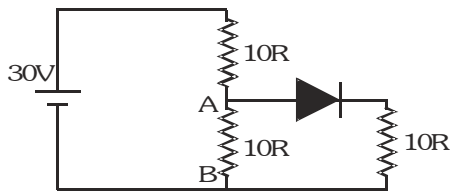
CHECK YOUR GRASP								ANSWER-KEY				EXERCISE-I											
Que	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20			
Ans.	1	2	3	2	1	1	2	4	2	3	1	3	2	1	4	1	1	2	2	2			
Que	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40			
Ans.	4	1	2	2,4	1	2	3	1	2	1	4	1	3	1	2	2	1	2	2	1			
Que	41	42	43	44	45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

BRAIN TEASERS

EXERCISE-II

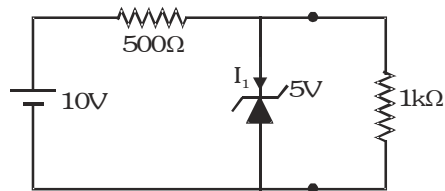
SEMI CONDUCTOR - ELECTRONICS

1. Find V_{AB} :-



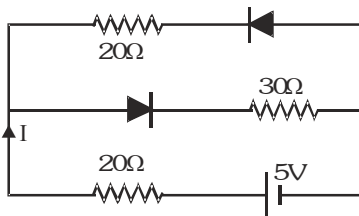
- (1) 10V (2) 20V (3) 30V (4) none

2. The current flowing through the zener diode in figure is :-



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

3. Current in the circuit will be :-



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

4. Electrical conductivities of Ge and Na are σ_1 , and σ_2 respectively. If these substances are heated, then

- (1) σ_1 decreases and σ_2 increases
(2) both σ_1 and σ_2 decreases
(3) both σ_1 and σ_2 increases
(4) σ_1 increases and σ_2 decreases

5. What is the voltage gain in a common emitter amplifier where input resistance is 3Ω and load resistance is 24Ω :- ($\beta = 6$)?

- (1) 2.2 (2) 1.2 (3) 4.8 (4) 48

6. The current of transistor in common emitter mode is 49. The change in collector current and emitter current corresponding to the change in the base current by $5.0\mu A$, will be:-

- (1) $245\mu A$, $250\mu A$ (3) $240\mu A$, $235\mu A$
(2) $260\mu A$, $255\mu A$ (4) none of these

7. In the CB mode of a transistor, when the collector voltage is changed by 0.5 volt. The collector current changes by 0.05 mA. the output resistance will be:-

- (1) $10k\Omega$ (2) $20k\Omega$
(3) $5k\Omega$ (4) $2.5k\Omega$

8. Zener diode is used for :-

- (1) rectification
(2) stabilisation
(3) amplification
(4) producing oscillations in an oscillator

9. Consider an n-p-n transistor amplifier in common-emitter configuration. The current gain of the transistor is 100. If the collector current changes by 1 mA, what will be the change in emitter current

- (1) 1.1 mA (2) 1.01 mA
(3) 0.01 mA (4) 10 mA

10. A transistor is used in the common emitter mode as an amplifier then :-

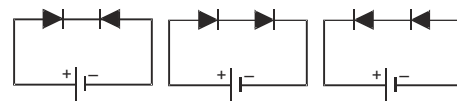
- (A) the base emitter junction is forward biased
(B) the base emitter junction is reverse biased
(C) the input signal is connected in series with the voltage applied to bias the base emitter junction
(D) the input signal is connected in series with the voltage applied to bias the base collector junction

- (1) A, B (2) A, D (3) A, C (4) only C

11. An electric field is applied to a semiconductor. Let the number of charge carriers density is 'n' and the average drift speed be v. If the temperature is increased :-

- (1) both n and v will increase
(2) n will increase but v will decrease
(3) v will increase but n will decrease
(4) both n and v will decrease

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



- (1) circuit 1 and 2 (2) circuit 2 and 3
(3) circuit 3 and 1 (4) circuit 1 only

13. In an n-p-n transistor circuit, the collector current is 20 mA. If 90% of electron emitted reach the collector :-

- (1) the emitter current will be 18 mA
(2) emitter current will be 22 mA
(3) base current will be 2 mA
(4) base current will be 1 mA

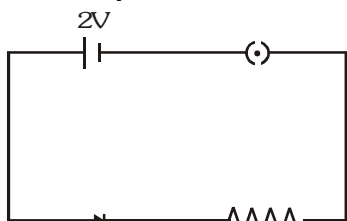
14. In sample of pure silicon 10^{13} atom/cm³ is mixed of phosphorus. If all doner atoms are active then what will be resistivity at 20°C if mobility of electron is $1200\text{ cm}^2/\text{Volt sec}$:-

- (1) 0.5209 ohm cm (2) 5.209 ohm cm
(3) 52.09 ohm cm (4) 520.9 ohm cm

15. Mobility of electrons in N-type Ge is $5000 \text{ cm}^2/\text{volt sec}$ and conductivity 5 mho/cm . If effect of holes is negligible then impurity concentration will be :-

(1) $6.25 \times 10^{15}/\text{cm}^3$ (2) $9.25 \times 10^{14}/\text{cm}^3$
 (3) $6 \times 10^{13}/\text{cm}^3$ (4) $9 \times 10^{13}/\text{cm}^3$

16. A two Volts battery forward biases a diode however there is a drop of 0.5 V across the diode which is independent of current. Also a current greater than 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 :-

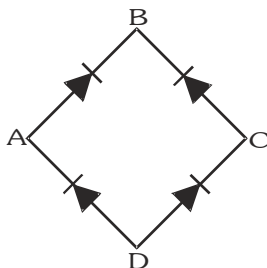


(1) $3 \text{ k}\Omega$ (2) $300 \text{ k}\Omega$ (3) 300Ω (4) $200 \text{ k}\Omega$

17. Forbidden energy gap of Ge is 0.75 eV , maximum wave length of incident radiation of photon for producing electron - hole pair in germanium semiconductor is :-

(1) 4200 \AA (2) 16500 \AA
 (3) 4700 \AA (4) 4000 \AA

18. In the figure, input is applied across A and C and output is taken

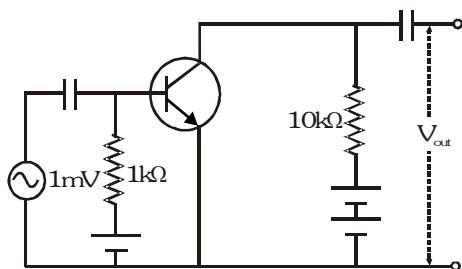


across B and D, then the output is :

(1) zero (2) same as input
 (3) full wave rectified (4) half wave rectified

19. An oscillator is nothing but an amplifier with
 (1) positive feedback (2) high gain
 (3) no feed back (4) negative feed back

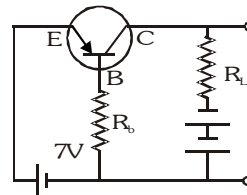
20. In the following common emitter configuration an 'npn' transistor with current gain $\beta = 100$ is used the output voltage of amplifier will be :-



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

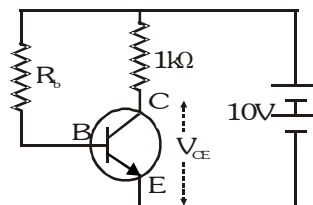
21. In the given transistor circuit, the base current is $35 \mu\text{A}$. The value of R_b is V_{BE} is assumed to negligible :-

(1) $100 \text{ k}\Omega$
 (2) $300 \text{ k}\Omega$
 (3) $200 \text{ k}\Omega$
 (4) $400 \text{ k}\Omega$



22. In the circuit shown here the transistor used has current gain $\beta = 100$. What should be the base resistor R_b so that $V_{CE} = 5 \text{ V}$, $V_{BE} = 0$:-

(1) $1 \times 10^3 \Omega$
 (2) 500
 (3) $200 \times 10^3 \Omega$
 (4) $2 \times 10^3 \Omega$



23. Choose the only false statement from the following

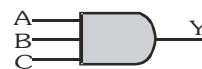
(1) the resistivity of a semiconductor increases with increase in temperature
 (2) substances with energy gap of the order of 10 eV are insulators
 (3) in conductors the valence and conduction bands may overlap
 (4) the conductivity of a semiconductor increases with increases in temperature

24. What will be conductance of pure silicon crystal at 300 K temperature. If electron hole pairs per cm^3 is 1.072×10^{10} at this temperature, $\mu_n = 1350 \text{ cm}^2/\text{volt sec}$ and $\mu_p = 480 \text{ cm}^2/\text{volt sec}$:-

(1) $3.14 \times 10^{-6} \text{ mho/cm}$
 (2) $3 \times 10^6 \text{ mho/cm}$
 (3) 10^{-6} mho/cm
 (4) 10^6 mho/cm

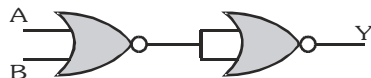
LOGIC GATES

25. The output of the given logic gate is 1 when inputs A, B and C are such that :-



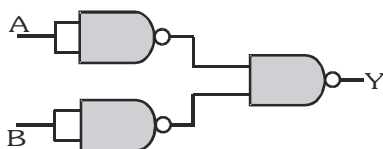
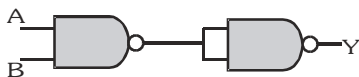
(1) $A = 1, B = 0, C = 1$
 (2) $A = 1, B = 1, C = 0$
 (3) $A = B = C = 0$
 (4) $A = B = C = 1$

26. The arrangement shown in figure performs the logic function of a/an gate :-



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

27. You are given two circuits as shown in following figure. The logic operation carried out by the two circuit are respectively :-



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

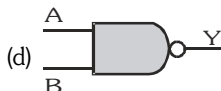
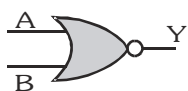
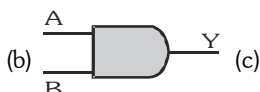
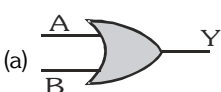
28. Which of the following Boolean expression is not correct :-

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

29. Which of the following relation is valid in Boolean algebra :-

- (1) $A + \overline{A} = 0$ (2) $A + A = 2A$
(3) $A + \overline{A} = 1$ (4) $A + \overline{A} = A$

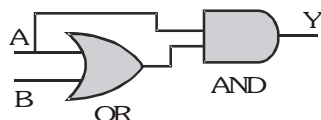
30. Given below are four logic symbols. Those for OR, NOR and NAND gates are respectively :-



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

31. The output Y of the combination of gates shown is equal to :-

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



32. Which of the following relations is valid for Boolean algebra :-

- (1) $A + A = A$ (2) $A + 1 = 1$
(3) $A . \overline{A} = 0$ (4) All

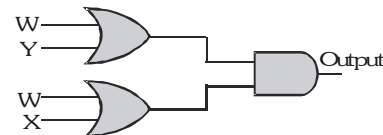
33. The diagram of a logic circuit is given below. The output of the circuit is represented by :-

(1) $W . (X + Y)$

(2) $X . (X.Y)$

(3) $W + (X + Y)$

(4) $W + (X.Y)$



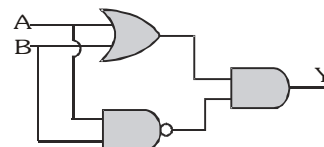
34. The following configuration of gates is equivalent to :-

(1) NAND

(2) OR

(3) XOR

(4) NOR



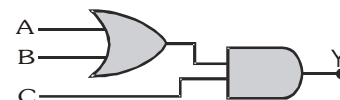
35. To get an output 1, the input ABC should be :-

(1) 101

(2) 100

(3) 110

(4) 010



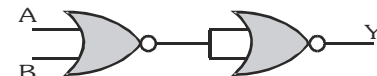
36. The circuit-shown here is logically equivalent to :-

(1) OR gate

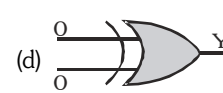
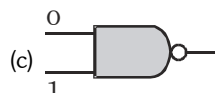
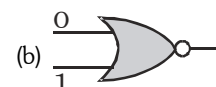
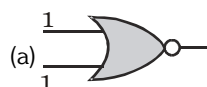
(2) AND gate

(3) NOT gate

(4) NAND gate

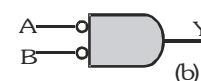
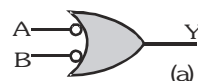


37. Which of the following will have an output of 1 :-



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

38. The logic symbols shown here are logically equivalent to :-



- (1) 'a' AND and 'b' OR gate
(2) 'a' NOR and 'b' NAND gate
(3) 'a' OR and 'b' AND gate
(4) 'a' NAND and 'b' NOR gate

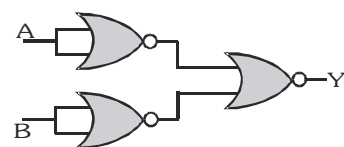
39. The combination of the gates shown will produce

(1) OR gate

(2) AND gate

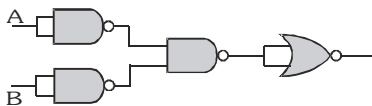
(3) NOR gate

(4) NAND gate

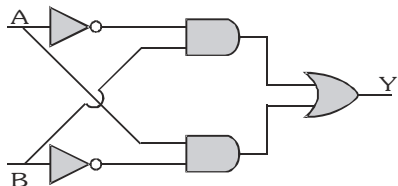


40. The combination of the gates shown will produce

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



41. Which of the following represents correctly the truth table of configuration of gates shown here



(1)

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

(2)

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

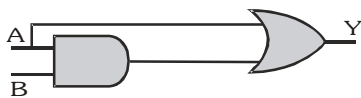
(3)

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

(4)

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

42. The truth table for the following combination of gates is :-



(a)

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

(b)

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

(c)

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

(d)

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

(1) a

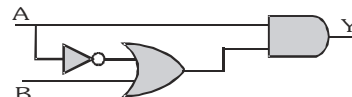
(2) b

(3) c

(4) d

43. The combination of the gates shown represents :-

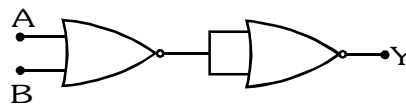
- (1) AND gate
- (2) OR gate
- (3) NAND gate
- (4) NOR gate



44. Which of the following relations is valid for Boolean algebra :-

- (1) $A(B + \bar{B}) = A$
- (2) $A + AB = A$
- (3) $A + 0 = A$
- (4) all

45. In the following circuit, the output Y for all possible inputs A and B is expressed by the truth table :



(1)

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

(2)

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

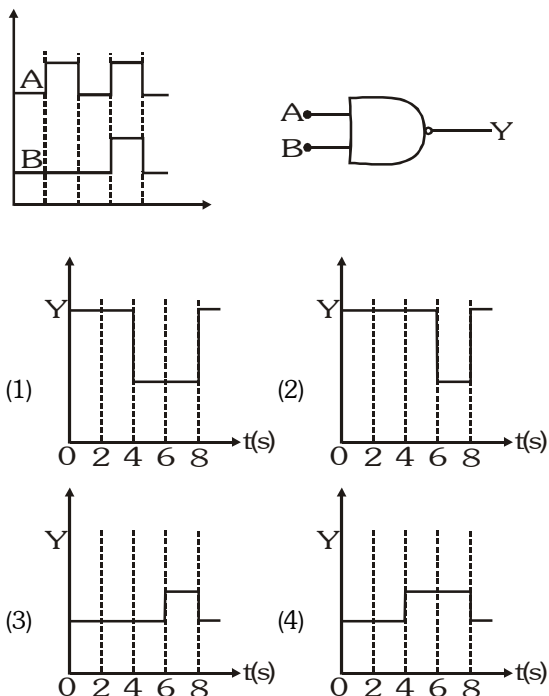
(3)

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

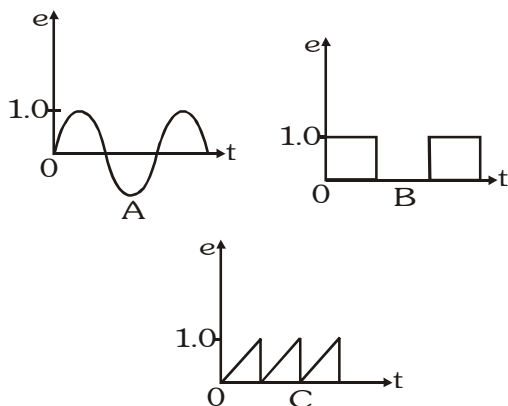
(4)

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

46. The real time variation of input signals A and B are as shown below. If the inputs are fed into NAND gate, then select the output signal from the following :-

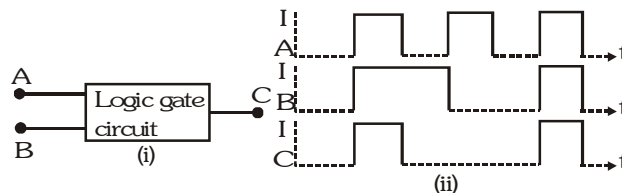


47. The time variations of signals are given as in A, B and C. Point out the true statement from the following :-



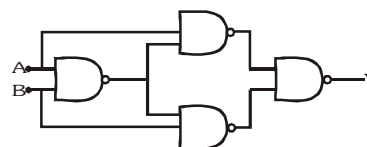
- (1) A, B and C are analogue signals
(2) A and C are analogue, but B is a digital signal
(3) A and C are digital, but B is analogue signal
(4) A, B and C are digital signal

48. The following figure shows a logic gate circuit with two inputs A and B and output C. The voltage waveforms of A, B and C are as shown in second figure given below :-



The logic circuit gate is :

- (1) OR gate
(2) AND gate
(3) NAND gate
(4) NOR gate
49. Select the outputs Y of the combination of gates shown below for inputs A = 1, B = 0 ; A = 1, B = 1 and A = 0, B = 0 respectively :-



- (1) (0 1 1) (2) (0 0 1)
(3) (1 0 1) (4) (1 1 1)
(5) (1 0 0)

BRAIN TEASERS

ANSWER-KEY

EXERCISE-II

Que.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Ans.	1	4	2	4	4	1	1	2	2	3	2	2	2,3	4	1	3	2	3	1	3
Que.	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
Ans.	3	3	1	1	4	1	1	4	3	3	1	4	4	3	1	1	2	4	2	3
Que.	41	42	43	44	45	46	47	48	49											
Ans.	3	1	1	4	3	2	2	2	5											

ASSERTION-REASON TYPE QUESTIONS
EXERCISE-III

1. **Assertion** :- Microwave communication is preferred over optical communication.
Reason :- Microwaves provide large number of channels and band width compared to optical signals.
 (1) A (2) B (3) C (4) D
2. **Assertion** : Diode lasers are used as optical sources in optical communication.
Reason : Diode lasers consume less energy.
 (1) A (2) B (3) C (4) D
3. **Assertion** : Television signals are received through sky-wave propagation.
Reason : The ionosphere reflects electromagnetic waves of frequencies greater than a certain critical frequency.
 (1) A (2) B (3) C (4) D
4. **Assertion**:- Electromagnetic waves with frequencies smaller than the critical frequency of ionosphere cannot be used for communication using sky wave propagation.
Reason:- The refractive index of the ionosphere becomes very high for frequencies higher than the critical frequency.
 (1) A (2) B (3) C (4) D
5. **Assertion**:- In optical fibre, the diameter of the core is kept small.
Reason:- This smaller diameter of the core ensures that the fibre should have incident angle more than the critical angle required for total internal reflection.
 (1) A (2) B (3) C (4) D
6. **Assertion** : The electromagnetic wave of shorter wavelength can travel longer distances on earth's surface than those of longer wavelength.
Reason : Shorter the wavelength, the larger is the velocity of wave propagation.
 (1) A (2) B (3) C (4) D
7. **Assertion**: The surface wave propagation is used for medium wave band and for television broadcasting.
Reason : The surface waves travel directly from transmitting antenna to receiver antenna through atmosphere.
 (1) A (2) B (3) C (4) D
8. **Assertion** : The television broadcasting becomes weaker with increasing distance.
Reason : The power transmitted from T.V. transmitter varies inversely as the distance of the receiver.
 (1) A (2) B (3) C (4) D
9. **Assertion** : Microwave propagation is better than the sky wave propagation.
Reason : Microwaves have frequencies 100 to 300 GHz, which have very good directional properties.
 (1) A (2) B (3) C (4) D
10. **Assertion** : Semiconductors do not obey Ohm's law.
Reason : Electric current is determined by the rate of flow of charge carries.
 (1) A (2) B (3) C (4) D
11. **Assertion** : Germanium is preferred over silicon for making semiconductor devices.
Reason : Energy gap for Ge is more than that of Si.
 (1) A (2) B (3) C (4) D
12. **Assertion** : A p-n junction cannot be used at ultra high frequencies.
Reason : Capacitive reactance of a p-n junction increases with increasing frequency.
 (1) A (2) B (3) C (4) D
13. **Assertion** : A p-n junction with reverse bias can be used as a photodiode to measure light intensity.
Reason : In a reverse bias condition the current is small but it is more sensitive to changes in incident light intensity.
 (1) A (2) B (3) C (4) D
14. **Assertion** : NAND or NOR gates are called digital building blocks.
Reason : The repeated use of NAND or NOR gates can produce all the basic or complex gates.
 (1) A (2) B (3) C (4) D
15. **Assertion** : Two p-n junction diodes placed back to back, will work as an n-p-n transistor.
Reason : The p-region of two p-n junction diodes back to back will form the base of n-p-n transistor.
 (1) A (2) B (3) C (4) D
16. **Assertion** : When base region has larger width, the collector current decreases.
Reason : In transistor, sum of base current and collector current is equal to emitter current.
 (1) A (2) B (3) C (4) D

17. **Assertion** : For faster action, n-p-n transistor is used.
Reason : In n-p-n transistor, the mobility of majority charge carries is more.
 (1) A (2) B (3) C (4) D
18. **Assertion** : To be used as amplifier, the transistor in the common emitter configuration is preferred to the common base configuration.
Reason : In the common emitter, the signal is applied between emitter and base.
 (1) A (2) B (3) C (4) D
19. **Assertion** : Many channels get allowed when transmission frequency is high.
Reason : At high frequencies, bandwidth is high.
 (1) A (2) B (3) C (4) D
20. **Assertion** : Optical fibres are free from electromagnetic disturbances.
Reason : Optical fibres are electrically insulated.
 (1) A (2) B (3) C (4) D
21. **Assertion** : Diode lasers are used as optical sources in optical communication.
Reason : Diode lasers consume less energy.
 (1) A (2) B (3) C (4) D
22. **Assertion** : Electromagnetic waves with frequencies smaller than the critical frequency of ionosphere cannot be used for communication using sky wave propagation.
Reason : The refractive index of the ionosphere becomes very high for frequencies higher than the critical frequency.
 (1) A (2) B (3) C (4) D
23. **Assertion** : In optical fibre, the diameter of the core is kept small.
Reason : This smaller diameter of the core ensures that the fibre should have incident angle more than the critical angle required for total internal reflection.
 (1) A (2) B (3) C (4) D

24. **Assertion** : For the same antenna length, power radiated by short wavelength signals would be large.
Reason : Because power radiated $\propto \frac{1}{\lambda^2}$.
 (1) A (2) B (3) C (4) D
25. **Assertion** : The electrical conductivity of earth's atmosphere increases with altitude.
Reason : The high energy particles (γ -rays and cosmic rays) coming from outer space while entering earth's atmosphere cause ionization of the atoms of the gases present in the atmosphere.
 (1) A (2) B (3) C (4) D
26. **Assertion** : Optical communication system is more economical than other systems of communications.
Reason : The information carrying capacity of a communication system is directly propotional to its bandwidth.
 (1) A (2) B (3) C (4) D
27. **Assertion** : A communication satellite is essentially a repeater in space.
Reason : It reflects the signals from transmitter to receiver.
 (1) A (2) B (3) C (4) D

Que.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Ans.	4	2	4	4	1	3	4	3	1	2	4	4	1	1	1	2	1	2	1	1
Que.	21	22	23	24	25	26	27													
Ans.	2	4	1	1	1	1	1													

PREVIOUS YEARS' QUESTIONS

EXERCISE-IV

1. At absolute zero, Si acts as-
[AIEEE - 2002]
(1) non-metal (2) metal
(3) insulator (4) none of these
2. The energy band gap is maximum in-
[AIEEE - 2002]
(1) metals (2) superconductors
(3) insulators (4) semiconductors
3. The part of a transistor which is most heavily doped to produce large number of majority carriers is-
[AIEEE - 2002]
(1) emitter
(2) base
(3) collector
(4) can be any of the above three
4. 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 the above increases
5. 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 carriers with temperature
(3) type of bonding
(4) variation of scattering mechanism with temperature
6. In the middle of the depletion layer of reverse biased p-n junction, the-
[AIEEE - 2003]
(1) electric field is zero
(2) potential is maximum
(3) electric field is maximum
(4) potential is zero
7. Consider telecommunication through optical fibres. Which of the following statements is not true ?
[AIEEE - 2003]
(1) Optical fibres can be of graded refractive index
(2) Optical fibres are subjected to electromagnetic interference from outside
(3) Optical fibres have extremely low transmission loss
(4) Optical fibres may have homogeneous core with a suitable cladding
8. 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
9. For a transistor amplifier in common emitter configuration for load impedance of $1\text{ k}\Omega$ ($h_{fe} = 50$ and $h_{oe} = 25\text{ }\mu\text{ A/V}$), the current gain is-
[AIEEE - 2004]
(1) - 5.2 (2) - 15.7
(3) - 24.8 (4) - 48.78
10. 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
11. 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
12. 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

13. 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) $\frac{\pi}{2}$

14. 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

15. In a common-base mode of a 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

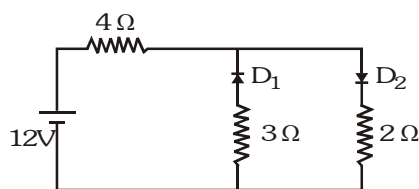
16. A solid which is not transparent to visible light and whose conductivity increases with temperature is formed by- [AIEEE - 2006]

(1) ionic binding
(2) covalent binding
(3) Van der Waal's binding
(4) metallic binding

17. 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]

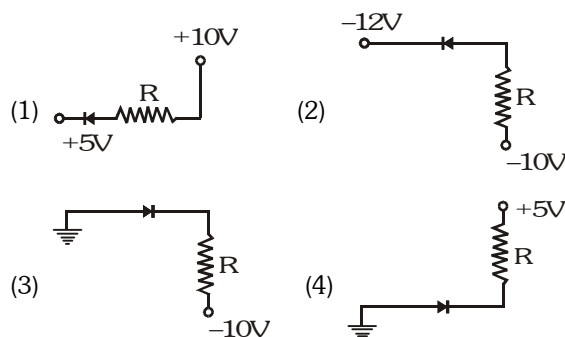
(1) $\frac{5}{8}$ (2) $\frac{4}{5}$ (3) $\frac{5}{4}$ (4) $\frac{4}{7}$

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

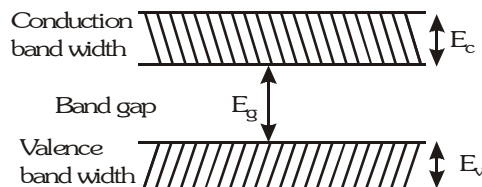


(1) 1.71 A (2) 2.00 A
(3) 2.31 A (4) 1.33 A

19. In the following, which one of the diodes is reverse biased? [AIEEE - 2006]



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

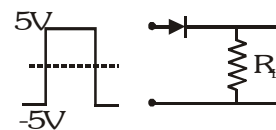


(1) All E_c , E_g , E_v increase
(2) E_c and E_v increase, but E_g decreases
(3) E_c and E_v decrease, but E_g increases
(4) All E_c , E_g , E_v decrease

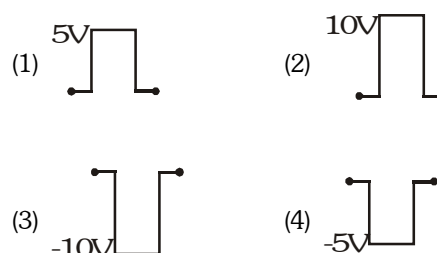
21. Carbon, silicon and germanium have four valence electrons each. At room temperature which one of the following statements is most appropriate? [AIEEE - 2007]

(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 negligible 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

22. If in a p-n junction diode, a square input signal of 10 V is applied as shown: [AIEEE - 2007]



Then, the output signal across R_L will be :-

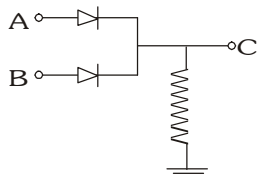


23. A working transistor with its three legs marked P, Q and R is tested using a multimeter. No conduction is found between P and Q. By connecting the common (negative) terminal of the multimeter to R and the other (positive) terminal to P or Q, some resistance is seen on the multimeter. Which of the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

[AIEEE - 2008]

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

24. In the circuit below, A

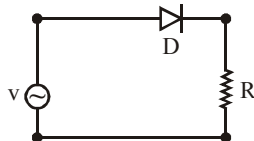


and B represent two inputs and C represents the output. The circuit represents

[AIEEE - 2008]

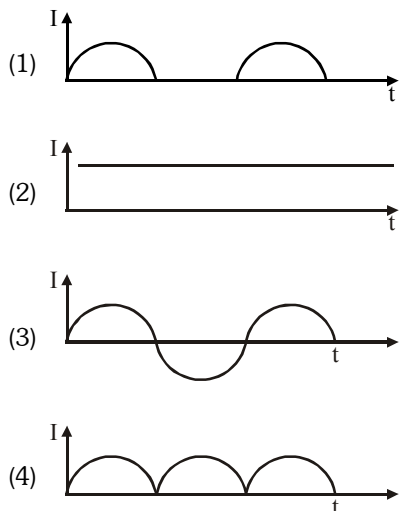
- (1) NOR gate
- (2) AND gate
- (3) NAND gate
- (4) OR gate

25. A p-n junction (D) shown in the figure can act as a rectifier. An alternating current source (V) is connected in the circuit.

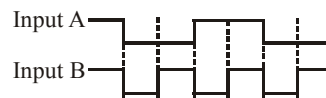
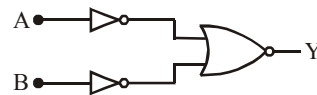


The current (I) in the resistor (R) can be shown by :-

[AIEEE - 2009]

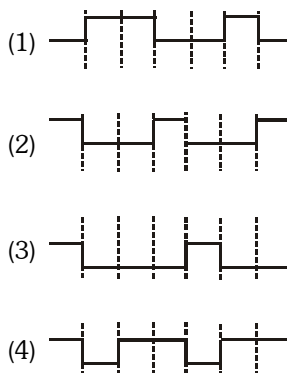


26. The logic circuit shown below has the input waveform 'A' and 'B' as shown. Pick out the correct output waveform :-



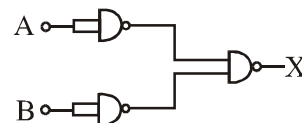
Output is :-

[AIEEE - 2009]



27. The combination of gates shown below yields:-

[AIEEE - 2010]



- (1) NAND gate
- (2) OR gate
- (3) NOT gate
- (4) XOR gate

28. This question has Statement-1 and Statement-2. Of the four choices given after the statements, choose the one that best describes the two statements.

Statement-1:

Sky wave signals are used for long distance radio communication. These signals are in general, less stable than ground wave signals.

Statement-2 :

The state of ionosphere varies from hour to hour, day to day and season to season. [AIEEE - 2011]

- (1) Statement-1 is true, Statement-2 is true and Statement-2 is not the correct explanation of Statement-1.
- (2) Statement-1 is false, Statement-2 is true
- (3) Statement-1 is true, Statement-2 is false
- (4) Statement-1 is true, Statement-2 is true and Statement-2 is the correct explanation of statement-1.

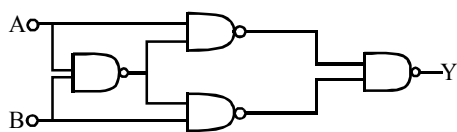
29. The output of an OR gate is connected to both the inputs of a NAND gate. The combination will serve as a : [AIEEE - 2011]

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

30. Which of the following four alternatives is not correct We need modulation :- [AIEEE - 2011]

- (1) To increase the selectivity
(2) To reduce the time lag between transmission and reception of the information signal
(3) to reduce the size of antenna
(4) To reduce the fractional band width, that is the ratio of the signal band width to the centre frequency

31. Truth table for system of four NAND gates as shown in figure is :- [AIEEE - 2012]



(1)

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

(2)

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

(3)

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

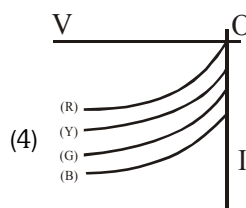
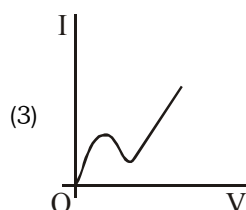
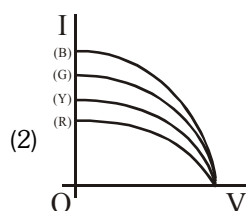
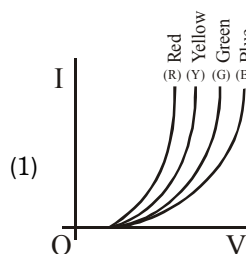
(4)

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

32. A diode detector is used to detect an amplitude modulated wave of 60% modulation by using a condenser of capacity 250 pico farad in parallel with a load resistance 100 kilo ohm. Find the maximum modulated frequency which could be detected by it. [JEE(Main) - 2013]

- (1) 10.62 MHz (2) 10.62 kHz
(3) 5.31 MHz (4) 5.31 kHz

33. The I-V characteristic of an LED is [JEE(Main) - 2013]



PREVIOUS YEARS QUESTIONS								ANSWER-KEY					EXERCISE-IV							
Que	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Ans.	3	3	1	3	2	3	2	4	4	3	3	3	3	3	1	2	3	2	4	3
Que	21	22	23	24	25	26	27	28	29	30	31	32	33							
Ans.	4	1	1	4	1	3	2	1	3	2	2	2	1							