PHYSICS

FOR IIT JEE ASPIRANTS OF CLASS 12 FOR PHYSICS

SEMI CONDUCTOR DEVICES

Solved Example

1. The number of silicon atoms per $m^3 is 5 \times 10^{28}$. This is doped simultaneously with 5×10^{22} atoms per m^3 of Arsenic and $5 \times 10^{20} per m^3$ atoms of indium. Calculate the number of electrons and holes. Given that $n_i = 1.5 \times 10^{16} m^{-3}$. Is the material n-type or p-type?

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2. A semiconductor has an electron concentration of $0.45 \times 10^{12} m^{-3}$ and a hole concentration of $5.0 \times 10^{20} m^{-3}$. Calculate its conductivity. Given electron mobility $= 0.135 m^2 V^{-1} s^{-1}$, hole mobility $= 0.048 m^2 V^{-1} s^{-1}$,

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3. A N-type silicon sample of width $4 \times 10^{-3} m$, thickness and length $6 \times 10^{-2} m$ carriers a current of $4.8 mA$, when the voltage is applied across the length of the sample. The free electron density is $10^{22} m^{-3}$

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4. The energy gap of pure Si is $1.1eV$ The mobilities of electrons and holes are respectively $0.135m^2V^{-1}s^{-1}$ and $0.048m^2V^{-1}s^{-1}$ and can be taken as independent of temperature. The intrinsic carrier concentration is given by $n_i = n_0 e^{-Eg/2kT}$.

Where n_0 is a constant, E_g The gap width and k The Boltmann's constant whose vaue is $1.38 \times 10^{-23} JK^{-1}$ The ratio of the electrical conductivities of Si at $600K$ and $300K$ is.

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5. In a $p-n$ junction diode, the curreict I can expressed as $I = I_0 \exp\left(\frac{eV}{2k_BT} - 1\right)$ where I_0 is called the reverse saturation current, V is the voltage across the diode and is positive for forward bias and negative for reverse bias, and I is

the current through the diode, K_B is the Boltzmann constant $\left(8.6 \times 10^{-5} eV / K\right)$ and T is the absolute temperature. If for a given diode $I_o = 5 \times 10^{-12} A$ and $T = 300K$, then

(a) What will be the forward current at a formward voltage of $0.6V$?

(b) What will be the increase in the current if the voltage across the diode is increased to $0.7V$?

(c) What is the dynamic resistance ?

(d) What will be current if reverse bias voltage changes from $1V$ to $2V$?

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6. The energy of a photon of sodium light $(\lambda = 589nm)$equal the band gap of a semiconducting material.(a)Find the

minimum energy E requried to create a hole-electron pair.

(b)Find the value of E/kT at a temperature of 300K.

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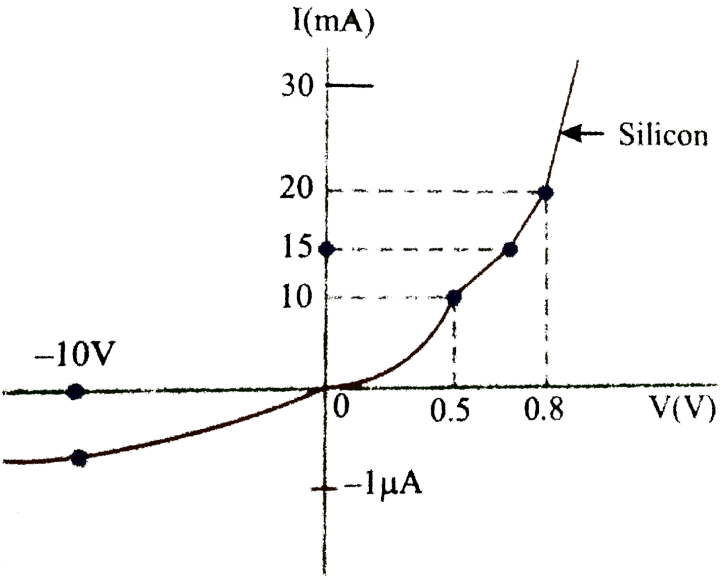
7. The $V-I$ characteristic of a silicon diode is shown in the Fig. Calculate the resistance of the diode at

(a) $I_D = 15mA$ and

(b) $V_D = -10V$.



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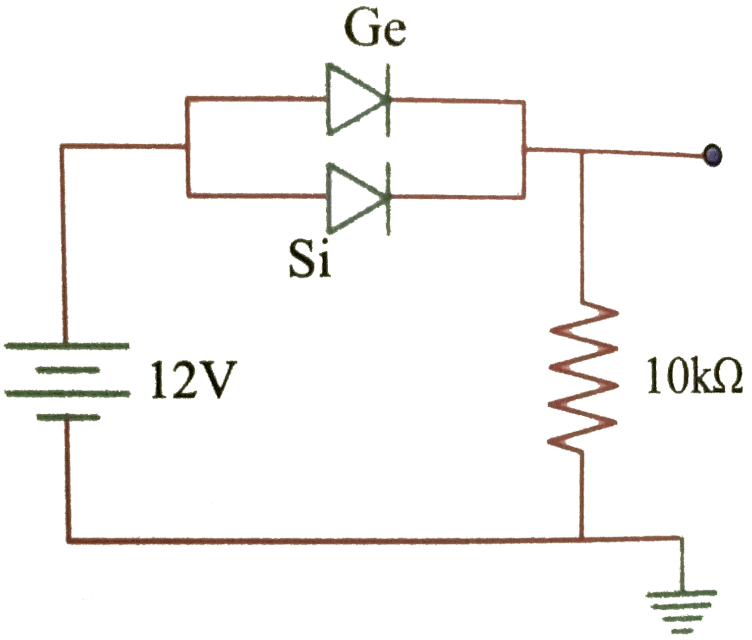
8. Two junction diodes, one of germanium (Ge) and other of silicon (Si) are connected as shown in fig to a battery of $12V$ and a load resistance $10k\Omega$. The germanium diode conducts at $0.3V$ and silicon diode at $0.7V$. When current flows in the circuit, the potential of terminal Y will be



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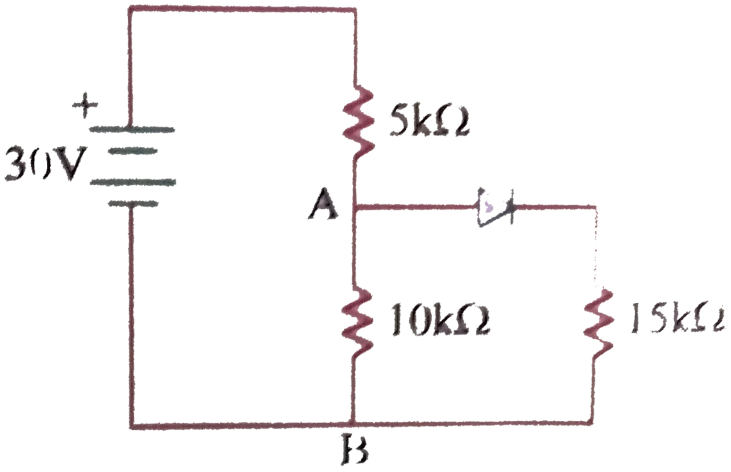
9. Find the maximum voltage across AB in the circuit shown in Fig. Assume that diode is ideal.



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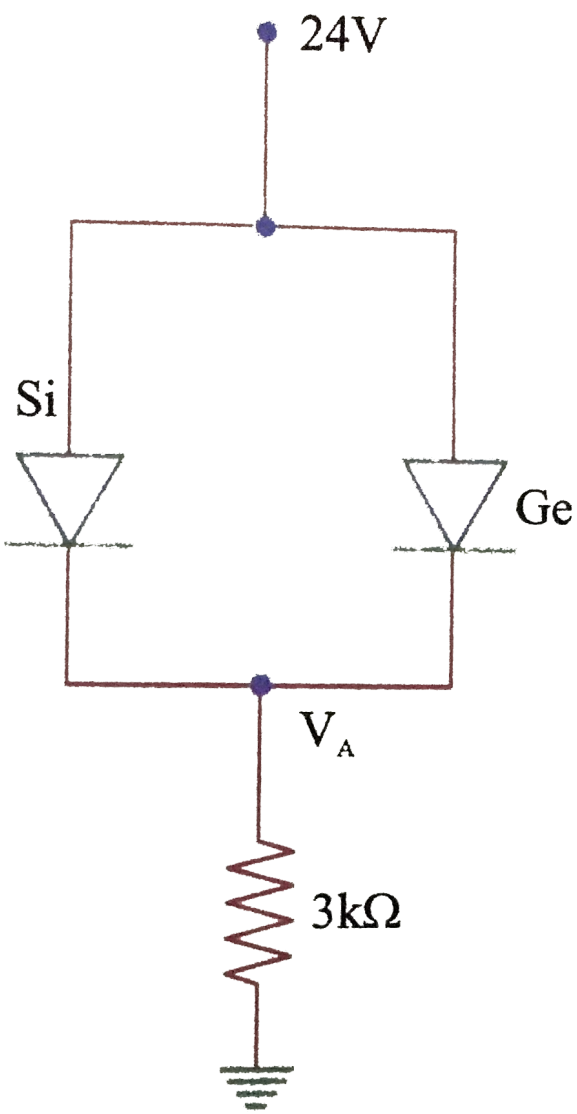
10. Find the voltage V_A in the curcuit shown in figure. The potential barrier for Ge is $0.3V$ and for Si is $0.7V$



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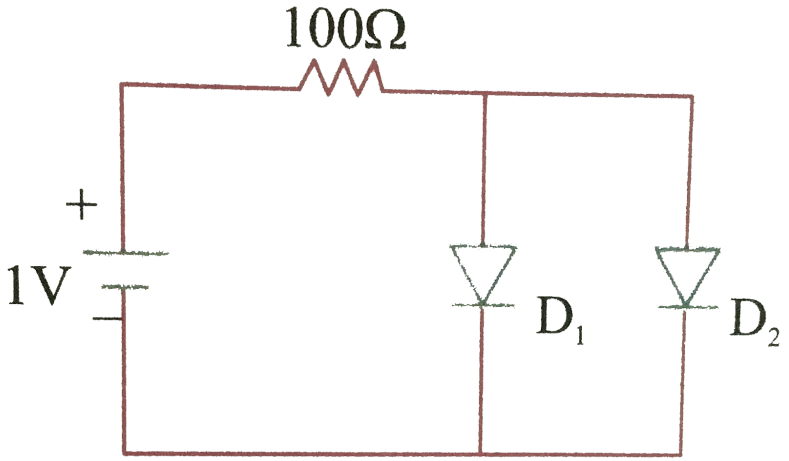
11. Considering the circuit and data given in the diagram, calculate the currents flowing in the diodes D_1 and D_2 Forward resistance of D_1 and D_2 is 20Ω.



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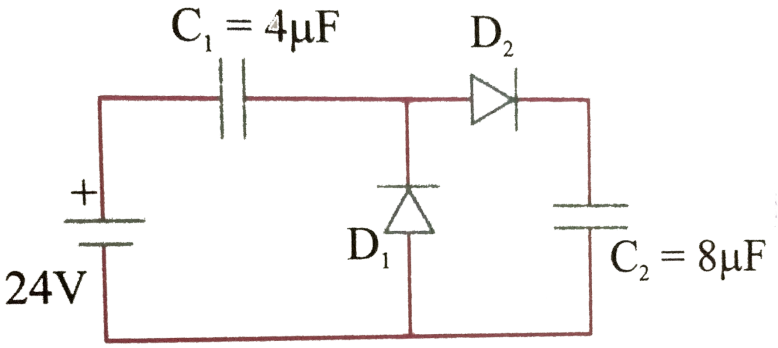
12. In the circuit shown. The potential drop across each capacitor is (assuming the two diodes are ideal).



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13. A potential barrier of 0.50V exists across a p-n junction.(a) If the depletion region is 5.0×10^{-7}m wide,what is the intensity of the electric field in this region?(b) An electron with speed $5.0 \times 10^{5} ms^{-1}$approaches the p-n junction form the n-side.With what speed will it enter the p-side?

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14. A $p-n$ diode is used in a half wave rectifier with a load resistance of 1000Ω. If the forward resistance $\left(r_f\right)$ of diode is 10Ω, calculate the efficiency of this half wave rectifier.

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15. A full wave rectifier uses two diodes with a load resistance of 100Ω. Each diode is having negligible forward resistance. Find the efficiency of this wave rectifier.

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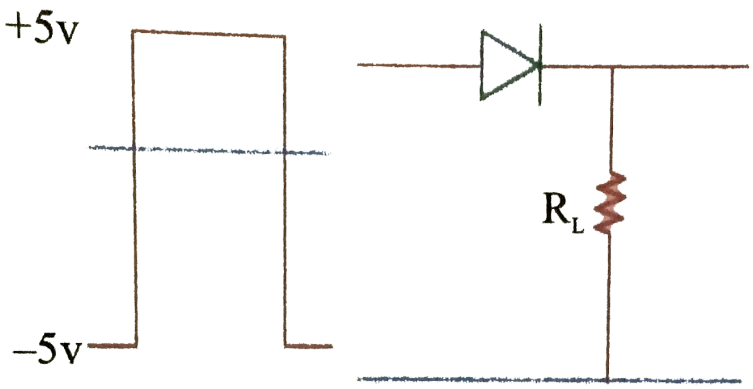
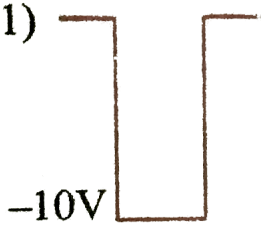
16. If a $p-n$ junction diode, a square input signal of $10V$ is applied as shown.

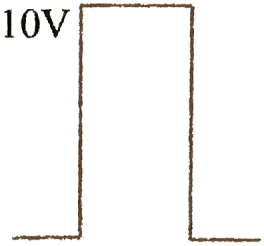


Then the out put signal across R_L will be

1)


2)


3)


4)


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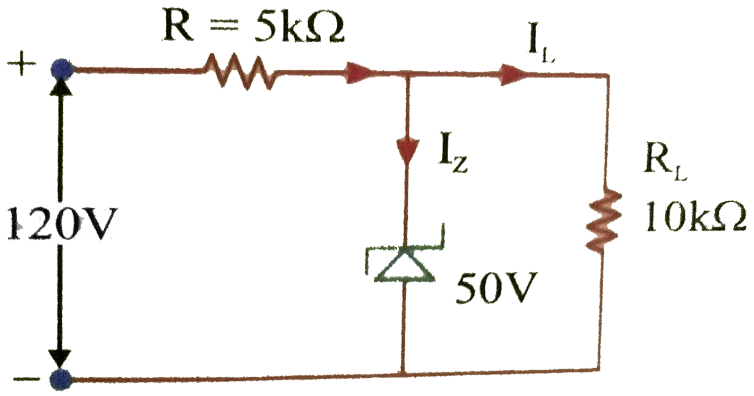
17. For the circuit shown in figure, Find

(1) the output voltage ,

(2) the voltage drop across series resistance ,

(3) the current through Zener diode.



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18. Current amplification factor of a common base configuration is 0.88. Find the value of base current when the emitter current is $1mA$.

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19. In a transistor, the emitter circuit resistance is 100Ω and the collector resistance is 100Ω. The power gain. If the emitter and collector currents are as sumed ton be equal, will be.

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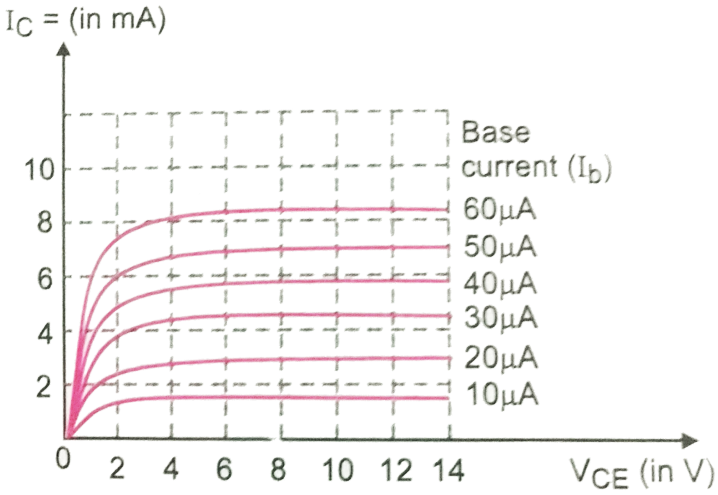
20. From the output characteristics of common emitter circuit shown in Fig., calculate the value of β_{ac} and β_{dc} of the

transistor when V_{cE} is $10V$ and $I_c = 4.0mA$.



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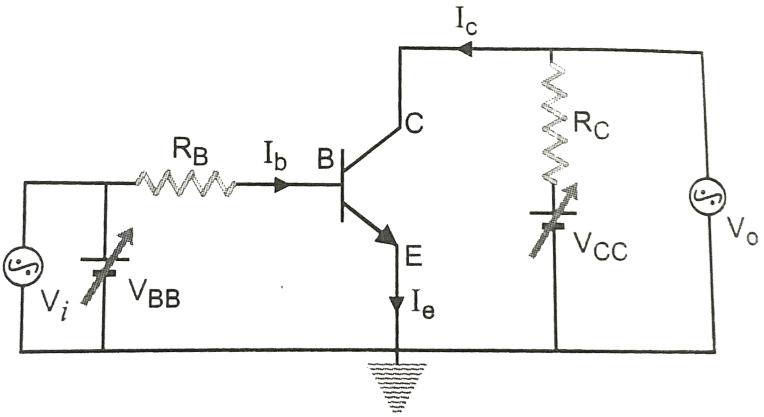
21. In common emitter transistor as shown in Fig., the V_{BB} supply can be varied from 0 V to 5.0V. The Si. Transistor has $\beta_{ac} = 250$ and $R_B = 100k\Omega$, $R_c = 1k\Omega$, $V_{CC} = 5.0V$. Assume that when the transistor is saturated, $V_{CE} = 0V$ and $V_{BE} = 0.8V$. Calculate the minimum base current, for which the transistor will reach saturation. Hence, determine V_i when

the transistor is 'switched on' find ranges of V_i for which the transistor is switched off and switched on.



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22. Two amplifiers are connected one after the other in series (cascaded). The first amplifier has a voltage gain of 10 and the second has a voltage gain of 20 . If the input signal is 0.01 V , calcualte the output AC signal .

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23. In a single state transistor amplifier, when the signal changes by $0.02V$ the base current by $10\mu A$ and collector current by $1mA$. If collector load $R_C = 2k\Omega$ and $R_L = 10k\Omega$, Calculate :

(i) Current Gain

(ii) Input Impedance,

(iii) Effective AC load,

(iv) Voltage gain and

(v) Power gain.

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24. An n-p-n transistor in a common - emitter mode is used as a simple voltage amplifier with a collector current of 4 mA. The positive terminal of a 8 V battery is connected to the collector through a load resistance R_L and to the base through a

resistance R_B . The collector - emitter voltage $V_{CE} = 4V$, the base - emitter voltage $V_{BE} = 0.6V$ and the current amplification factor $\beta = 100$. Calculate the values of R_L and R_B .

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25. In a negative feedback amplifier, the gain without feedback in 100, feed back ratio is $1/25$ and input voltage is $50mV$. Calculate

(i) gain with feedback

(ii) feedback factor

(iii) output voltage

(iv) feedback voltage

(v) new input voltage so that output voltage with feedback equals the output voltage without feedback.

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26. Convert binary number 10111 into decimal number.

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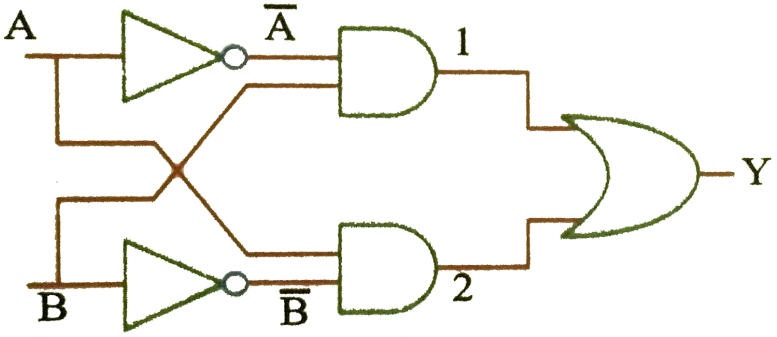
27. The Boolean expression of the output Y of the inputs A and B for the circuit shown in the fig.



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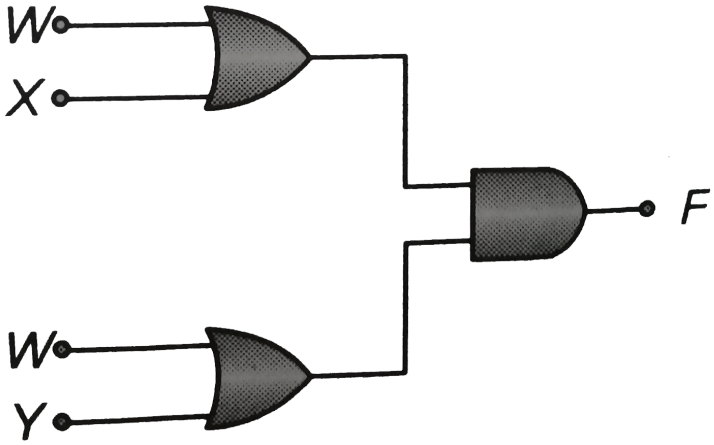
28. The diagram of a logic circuit is given below. The output F of the circuit is represented by



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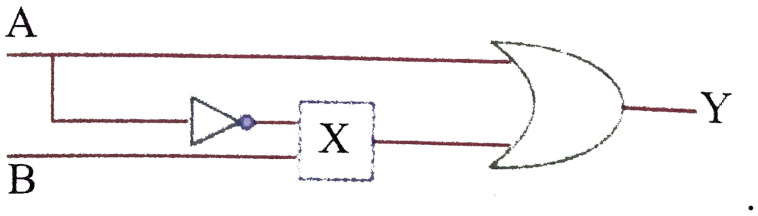
29. The logic circuit and its truth table are given, what is the gate X in the diagram

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



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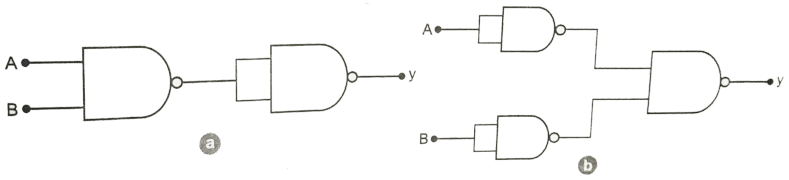
30. You are given two circuit as shown in Fig.and . Which consists of NAND gates. Identify the logic operation carried out by the two circuits.



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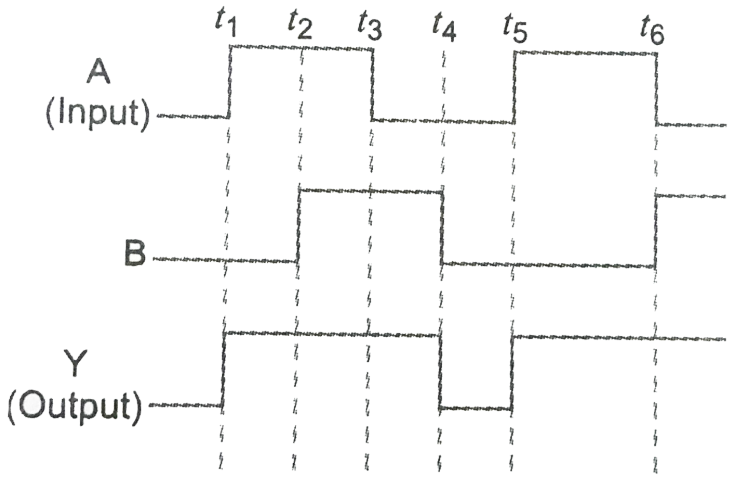
31. Justify the output wavefrom (y) of the OR gate for input and as gives in Fig.



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32. Draw logic diagrams for the Boolean expressions given below :

(i) $A \cdot \overline{B} + \overline{A} \cdot B = Y$

(ii) $\left(A + \overline{B}\right) \cdot \left(\overline{A} + B\right) = Y.$

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CUQ

1. Which property makes the crystalline solids to have sharp melting point ?

A. Equal strength of all the interatomic bonds

B. anisotropic

C. long range order

D. short range order

Answer: A

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2. Which of the following is not a property of crystalline substance

A. sharp melting point

B. bounded by flat surface

C. isotropic

D. long range order

Answer: C

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3. A piece of copper and another of germanium are cooled from room temperature to $80K$. The resistance of

A. each of these decreases

B. copper strip decreases and that of germanium decreases

C. copper strip decreases and that of germanium increases

D. each of these increases

Answer: C

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4. The difference in the variation of resistance with temperature in a metal and a semiconductor arises essentially due to the difference in the

A. crystal structure

B. variation of the number of charge carries with temperature

C. type of bonding

D. variation of scattering mechanism with temperature

Answer: B

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5. The manifestation of band structure in solids is due to

A. Heisenberg's uncertainty principle

B. Pauli's exclusive principle

C. Bohe's correspondence principle

D. Boltzman's law

Answer: B

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6. A solid which is not transperent to visible light and whose conductivily increase with temperature is formed by

A. ionic bonding

B. covalent bonding

C. vander Wall's bonding

D. metallic bonding

Answer: B

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7. To a germanium sample, traces of gallium are added as an impurity. The resultant sample would behave like

A. A conductor

B. An-type semiconductor

C. A n-type semiconductor

D. An insulator

Answer: B

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8. In semiconductors at a room temperature

A. The valence band is partially empty and the conduction band is partially filled.

B. The valence band is completely filled and the conduction band is partially filled

C. The valence band is completely filled

D. The conduction band is completely filled

Answer: A

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9. Identify the property which is not characteristic for a semiconductor ?

A. at a very low temperatures, it behaves like an insulator

B. at higher temperatures two types of charge carries will cause conductivity

C. the charge carries are electrons and holes in the valence band at higher temperatures.

D. the semiconductor is electrically neutral.

Answer: C

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10. Carbon , silicon and germanium have four valence electrons each . At room temperature which one of the following statements is most appropriate ?

A. The number of free conduction electrons is negligibly small in all the three

B. The number of free electrons for conduction is significant in all the three.

C. The number of free electrons for conduction is significant only in Si and Ge but small in C.

D. The number of free conductor electrons is significant in C but small in Si and Ge.

Answer: C

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11. The relation between number of free electrons (n) in a semiconductor and temperature (T) is given by

A. $n \propto T$

B. $n \propto T^2$

C. $n \propto \sqrt{T}$

D. $n \propto T^{3/2}$

Answer: D

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12. An electrically neutral semiconductor has

A. equal amounts of negative and positive charge

B. no minority charge carries

C. no majority charge carriers

D. no free charges

Answer: A

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13. There is no hole current in conductors because they have

A. high conductivity

B. high electron density

C. no valence band

D. overlapping of valence and conduction bands.

Answer: D

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14. In the insulators

A. the valence band is partially filled with electrons

B. the conduction band is partiallt filled with electrons

C. the conduction band is partially filled with electrons and valence band is empty

D. the conduction band is empty and the valence band is filled with electrons.

Answer: D

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15. In semiconductors the for bidden energy gap between $V.B$ and $C.B$ is of the order of

A. 1 eV

B. 5 eV

C. 1 KeV

D. 1 MeV

Answer: A

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16. The level formed due to impurity atom, in the for hidden energy gap, very near to the valence band in a p-type semiconductor is called

A. acceptor level

B. donar level

C. conduction level

D. forbidden level

Answer: A

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17. The bond in semiconductors is

A. covalent

B. ionic

C. metallic

D. hydrogen

Answer: A

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18. On increasing temperature, the conductivity of pure semiconductors

A. decreases

B. increases

C. remains unchanged

D. becomes zero

Answer: B

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19. The mobility of free electrons is greater then that of free holes because

A. they carry negative charge

B. they are light

C. their matual collisions are less

D. they require low energy to continue their motion

Answer: D

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20. A semiconductor at $0K$ behaves as

A. conductor

B. insulator

C. super conductor

D. extrinsic semiconductor

Answer: B

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21. Carbon , silicon and germanium have four valence elcectrons each . These are characterised by valence and conduction bands separated by energy band - gap respectively equal to $(E_g)_c (E_g)_{si}$ and $(E_g)_{Ge}$. Which of the following statements ture ?

A. $(E_g)_{Si} < (E_g)_{Ge} < (E_g)_C$

B. $(E_g)_C < (E_g)_{Ge}) > (E_g)_{Si}$

C. $(E_g)_C > (E_g)_{Si} > (E_g)_{Ge}$

D. $(E_g)_C = (E_g)_{Si} = (E_g)_{Ge}$

Answer: C

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22. The valency of impurity element for making p-type semiconductors is

A. 5

B. 4

C. 3

D. 7

Answer: C

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23. In n-type semiconductors the electron concentration is equal to

A. density of donor atoms

B. density of acceptor atoms

C. density of both type of atoms

D. neither density of acceptor atoms nor density of donor atoms

Answer: A

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24. Which of the following statements is not true ?

A. the resistance of intrinsic semiconductors decreases with increase of temperature

B. doping pure Si with trivalent impurities gives p-type semiconductors

C. the majority charge carries in n-type semiconductors are holes

D. a $p-n$ junction can act as a semiconductor diode

Answer: C

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25. p-type semiconductor is

A. negativity charged

B. positively charged

C. neutral

D. may be positive or negative

Answer: C

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26. n-type semiconductor is

A. negativity charged

B. positively charged

C. neutral

D. may be positive or negative

Answer: C

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27. An electric field is applied across a semiconductor. Let n be the number of charge carries. As temperature increases, n will

A. increase

B. decrease

C. does not change

D. may increase or decrease

Answer: A

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28. In a n-type semiconductor, the femi energy level lies

A. in the forbidden energy gap nearer to the conduction band.

B. in the forbidden energy gap nearer to the valence band.

C. in the middle of forbidden energy gap

D. outside the forbidden energy gap

Answer: A

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

A. Arsenic and phosphrous

B. Indium and aluminium

C. Phosphorous and indium

D. aluminium and boron

Answer: C

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30. The width of forbidden gap in silicon crystal is $1.2ev$. When the crystal is converted into a n-type semiconductor the distance of fermi level from conduction band is Greater than $0.55eV$

A. Greater than $0.55eV$

B. Equal to $0.55eV$

C. lesser than $0.55eV$

D. Equal to $1.1eV$

Answer: C

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31. In extrinsic semiconductors

A. the conduction band and valence band overlap

B. thegap between conduction band and valence band is near about $16eV$

C. the gap between conduction band and valence band is near about $1eV$

D. The gap between conduction band and valence band will be $100eV$ and more

Answer: C

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32. The element that can be used as acceptor impurity to dope silicon is

A. Antimony

B. Arsenic

C. Boron

D. phosphorous

Answer: C

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33. Among the following, the wrong statement on the case of semiconductor is

A. Resistivity is in between that of a conductor and insulator

B. Temperature coefficient of resistance is negative

C. Doping increases conductivity

D. At absolute zero temperature it behaves like a conductor.

Answer: D

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34. The value indicated by fermi energy level in an intrinsic semiconductor is

A. the average energy of electrons and holes

B. the energy of electrons in conduction band

C. the energy of holes in valence band

D. the energy of forbidden region

Answer: A

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35. The conduction band and valency band of a good conductors are

A. well separated

B. just touch

C. very close

D. overlap

Answer: D

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36. Two pieces one of germinium and the other of aluminium are cooled from $T_1 K$ to $T_2 K$. The resistance of

A. aluminium increases and that of gertmanium decreases

B. each of them decreases

C. aluminium decreases and that of germanium increases

D. each of them increases

Answer: C

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37. In intrinsic semiconductor at room temperature the no. of electrons and holes are

A. equal

B. zero

C. unequal

D. infinite

Answer: A

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38. Band gap in insulator is of the order

A. $6eV$

B. $0.60eV$

C. $-6eV$

D. $0eV$

Answer: A

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39. In p-type semiconductor conduction in due to

A. greater number of holes and less number of electrons

B. only electrons

C. only holes

D. greater number of electrons and less number of holes

Answer: A

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40. In an intrinsic semiconductor, the fermi energy level is

A. nearear to valence band than conduction band

B. equidistant from conduction band and valence band

C. nearer to conduction band than valence band

D. bisecting the conduction band

Answer: B

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41. With increase in temperature in an intrinsic semiconductor the ration of conduction electrons and holes is

A. $1:1$

B. $1:2$

C. $2:1$

D. $1:3$

Answer: A

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42. To obtain n-type extrinsic semiconductor, the impurity element to be added to germanium should be of valency

A. 2

B. 5

C. 4

D. 3

Answer: B

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43. The majority carries in a p-type semiconductor are....

A. Electrons

B. Holes

C. Both

D. Impurities

Answer: B

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44. The objective of adding impurities in the extrinsic semiconductor is

A. to increase the conductivity of the semiconductor

B. to increase the density of total current carries

C. to increase the density of either holes or electrons but not both

D. to eliminate the electron-hole pairs produced in intrinsic semiconductor.

Answer: C

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45. In intrinsic semiconductor conductivity is

A. low

B. average

C. high

D. very low

Answer: A

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46. In intrinsic semiconductor conductivity is due to.

A. doping

B. breaking of covalent bonds

C. free electrons

D. holes

Answer: B

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47. When the conductivity of a semiconductor is only due to breaking of covalent bonds, the semi conductor is called.

A. n-type

B. p-type

C. intrinsic

D. extrinsic

Answer: C

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48. Assertion (A) : C, Si and Ge have 4 Valancy each both but C is an insulator where as Si and Ge are semi conductors

Reason (R) : Energy gap is least for Ge, less for Si compared to C, So that free electrons for conduction in Ge and Si are significant but negligible small for C.

A. A, R are true and R explains A correctly

B. A, R are true and R do not explain A correctly

C. A is true, but R is false

D. R is true, but A is false

Answer: A

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49. The potential barrier at PN junction is due to

A. fixed acceptor and donor ions on either side of the junction

B. minority carriers on either side of the junction

C. majority carriers on either side of the junction

D. both majority and minority carriers on either side of junction

Answer: A

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50. A PN junction diode cannot be used

A. as rectifier

B. for converting light energy to electric energy

C. for gettting light radiation

D. both majority and minority carriers on either side of junction

Answer: D

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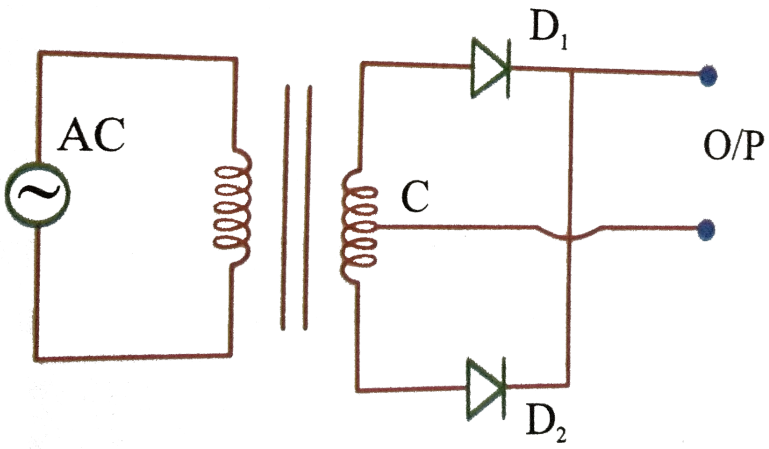
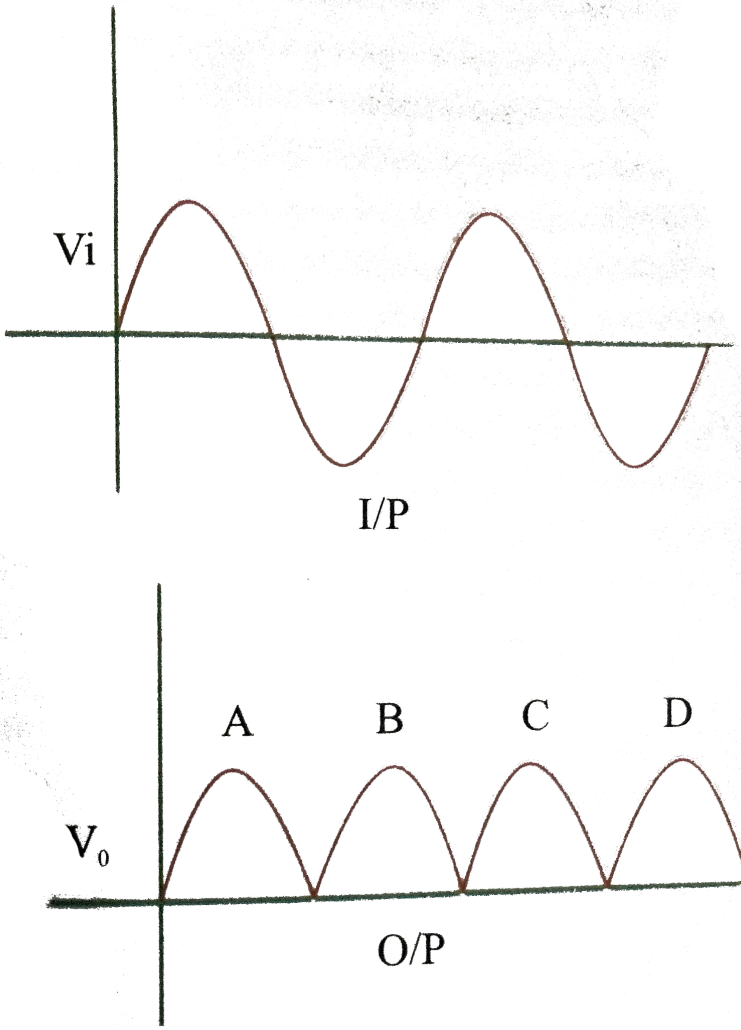
51. A full wave rectifier with the output is shown in fig. the contributions from the diode (2) are.


AC
D1
O/P
C
D2



A. C

B. A,C

C. B,D

D. A,B.C,D

Answer: C

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52. A full-wave rectifier is used to convert 'n' $HZa.\ c$ into $d.\ c$, then the number of pulses per second present in the rectified voltage is.

A. n

B. $n/2$

C. $2n$

D. $4n$

Answer: C

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53. If the input frequency of half-wave rectifier is $nHzac$, then its output is

A. a constant dc

B. $n/2Hz$ pulsating dc

C. nHz pulsating dc

D. $2nHz$ pulsating dc

Answer: C

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54. $p-n$ junction diode acts as

A. ohmic resistance

B. non-ohmic resistance

C. both 1 and 2

D. amplifier

Answer: B

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55. The process of converting alternating current into direct current is known as

A. modulation

B. amplification

C. detection

D. rectification

Answer: D

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56. On increasing reverse voltage in a $p-n$ junction diode the value of reverse current will

A. gradually increases

B. first remains constant and then suddenly increase

C. remains constant

D. gradually decrease

Answer: B

Watch Video Solution

57. In forward bias the depletion layer behaves like

A. an insulator

B. a conductor

C. a semiconductor

D. capacitor

Answer: B

Watch Video Solution

58. $p-n$ junction in reverse bias behaves like

A. an inductor

B. a condenser

C. amplifier

D. an off switch

Answer: D

Watch Video Solution

59. The main cause of avalence breakdown is

A. collision by ionisation

B. high doping

C. recombination of electrons and holes

D. low doping

Answer: A

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60. The main cause of Zener breakdown is.

A. the base semiconductor being germanium

B. production of electron - hole pairs due to thermal exitation

C. low doping

D. high doping

Answer: D

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61. When $p-n$ junction is forward biased, the current across the junction is mainly due to

A. diffusion of charges

B. drifting of charges

C. both diffusion and drifting of charges

D. holes only

Answer: A

Watch Video Solution

62. The current through any $p-n$ junction is due to

(a) drift of charge carriers

(b) diffusion of charge carriers

(c) different concentrations of same type of charge carriers in different regions.

(d) Same concentrations of same type of charge carriers in different regions

A. a, b and c

B. a and b only

C. only d

D. a, b, c, d

Answer: A

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63. The thickness of depletion layer is approximately

A. $1\mu m$

B. $1mm$

C. $1cm$

D. $1m$

Answer: A

Watch Video Solution

64. The depletion region is

A. region of opposite charges

B. neutral region

C. region of infinite energy

D. regon of free current carriers

Answer: D

Watch Video Solution

65. Diffusion current in a p-n junction is greater than the drift current in magnitude

A. forward biased

B. reverse biased

C. un biased

D. both forward and reverse biased

Answer: A

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66. Germanium diode.

A. may be used as rectifier because it offers a relatively low resistance for forward bias and very high resistance for reverse bias.

B. may be used as a rectifier because it offers a relatively high resistance for forward bias and very low resistance for reverse bias.

C. cannot be used as a rectifier

D. may be used as an amplifier

Answer: A

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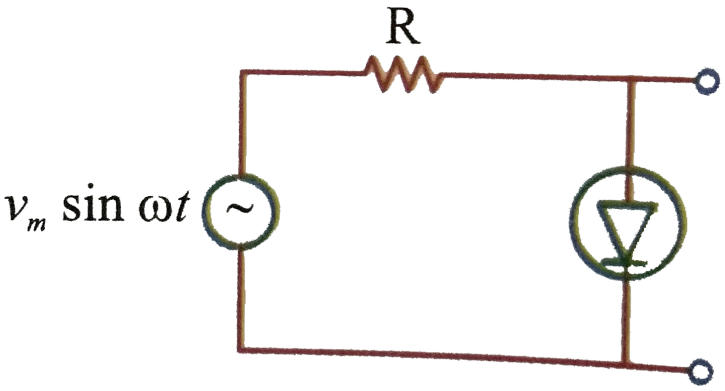
67. The output of the given circuit in Fig.



A. would be zero at all times

B. would be like a half-wave rectifier with positive cycles in output

C. would be like a half-wave rectifier with negative cycles in output

D. would be like that of a full-wave rectifier.

Answer: C

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68. Diode is forward biased and the applied voltage is greater than the potential barrier then

(I) resistance of the junction in the forward bias decreases

(II) potential barrier remains same

(III) width barrier remains decreases

(IV) p-type is at higher potential than the n-type.

A. all are true

B. all are false

C. I, III, IV are true

D. I, II, III are true

Answer: C

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69. When a junction diode is reverse biased, then current called drift current is due to

A. majority changes carriers of both $n\&p$ sides

B. minority charge carriers of both $n\&p$sides

C. holes of both $n\&p$ sides

D. conduction band electrons of n-side only

Answer: B

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

A. the width of depletion region decreases

B. free electron on n-side will move towards the junction

C. holes on p-side move towards the junction

D. electron on n-side and holes on p-side will move away from junction

Answer: D

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71. Considering $a.\ p-n$ junction as a capacitor, forward with p and n material acting as thin metal electrodes and depletion layer width acting as seperation between them. Basing on this assume that a $n-p-n$ transistor is working as an amplifier

in CE configuration. If C_1 and C_2 are base-emiter and collector emitter junction capacitances, then :

A. $C_1 > C_2$

B. $C_1 < C_2$

C. $C_1 = C_2$

D. $C_1 = C_2 = 0$

Answer: A

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

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

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

A. Both 1 & 2 are true

B. Both 1 & 2 are false

C. 1 is true 2 is false

D. 1 is false but 2 is true

Answer: B

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

(a) in forward bias

(b) in reverse bias

(c) in parallel to the load

(d) in series to the load.

A. (a) and (b) are correct

B. (b) and (c) are correct

C. (a) only is correct

D. (d) only is correct

Answer: B

Watch Video Solution

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

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

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

A. A and B are correct

B. A and B are wrong

C. A is correct but B is wrong

D. A is wrong but B is correct.

Answer: C

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75. Consider the following statement A and B and identify the correct choice of the given answers

A: The width of the depletion layer in a $P-N$ junction diode increases in forwards biase

B: In an intrinsic semiconductor the fermi energy level is exactely in the middle of the forbidden gap

A. A is true and B is false

B. Both A and B are false

C. A is false and B is true

D. Both A and B are true

Answer: C

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76. The potential in the depletion layer due to.

A. Electrons

B. Holes

C. Ions

D. Forbidden band

Answer: C

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77. Pickout the incorrect statement regarding reverse saturation current in the $p-n$ junction diode.

A. this currect doubles for every $100^{\circ}C$ rise of temperature

B. the current is due to minority carriers

C. the curreny carriers are produced by thermal agitation

D. reverse saturation current is also known as leakage current

Answer: A

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78. When the $p-n$ junction diode is reverse biased, the thickness of the depletion layer

A. increase

B. decrease

C. becomes zero

D. remains constant

Answer: A

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79. $p-n$ junction diode can be used as

A. amplifier

B. detector

C. oscillator

D. capacitor

Answer: B

Watch Video Solution

80. A $p-n$ junction diode is reverse biased. Then

A. more current flows

B. the barrier potential decreases

C. the barrier potential increases

D. resistance offered is low

Answer: C

Watch Video Solution

81. In the middle of the depletion layer of a reverse - biased $p-n$ junction , the

A. electric field is zero

B. potential is maximum

C. electric field is maximum

D. potential is zero

Answer: C

Watch Video Solution

82. When $p-n$ junction diode is forward biased then

A. the depletion region is reduced and barrier height is increased

B. the depletion region is widened and barrier height is reduced

C. both the depletion region and barrier height are reduced

D. both the depletion region and barrier height are increased

Answer: C

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83. In a $p-n$ junction photo cell, the value of the photo electromotive force produced by monochromatic light is proportional to

A. The barrier voltage at the $p-n$ junction

B. The intensity of the light falling on the cell

C. The frequency of the light falling on the cell

D. The voltage applied at the $p-n$ junction

Answer: B

Watch Video Solution

84. There is a sudden increase in current in zener diode is

A. Due to rupture of bonds

B. Resistance of deplection layer becomes less

C. Due to high doping

D. Due to less doping

Answer: A

Watch Video Solution

85. Application of a forward biase to a $p-n$ junction:

A. increases the number of donors on the n-side

B. increases the electric field in the depletion zone

C. increases the potential difference across the depletion zone

D. widens the depletion zone

Answer: A

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86. In a p- n junction diode not connected to any circuit,

A. the potential is the same everywhere

B. then p-type side is at a higher potential than the n-type side.

C. there is an electric field at the junction directed from the n-type side to the p-type side.

D. there is an electric field at the junction directed from the p-type side to then n-type side.

Answer: C

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87. Select the correct statement from the following :

A. A diode can be used as a rectifier

B. A triode cannot be used as a rectifier

C. The currect in a diode is always proportional to the applied voltage

D. The linear portion of the $I - V$ characteristic of a triode is used for amplification without distortion.

Answer: A

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88. When a PN juction diode is forwards biased, energy is released at the juction due to the recombination of electrons and holes. This energy is in

A. Visible region

B. Infrared region

C. UV region

D. X-ray region

Answer: B

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89. A Si and a Ge diode has identical physical dimensions. The band gap in Si is larger than that in Ge. An indentical reverse

bias is applied across the diodes.

A. The reverse current in Ge is larger than that in Si

B. The reverse current in Si is larger than that in Ge

C. The reverse current is identical in the two diodes

D. The relative magnitude of the reverse currents cannot be determined from the given data only.

Answer: C

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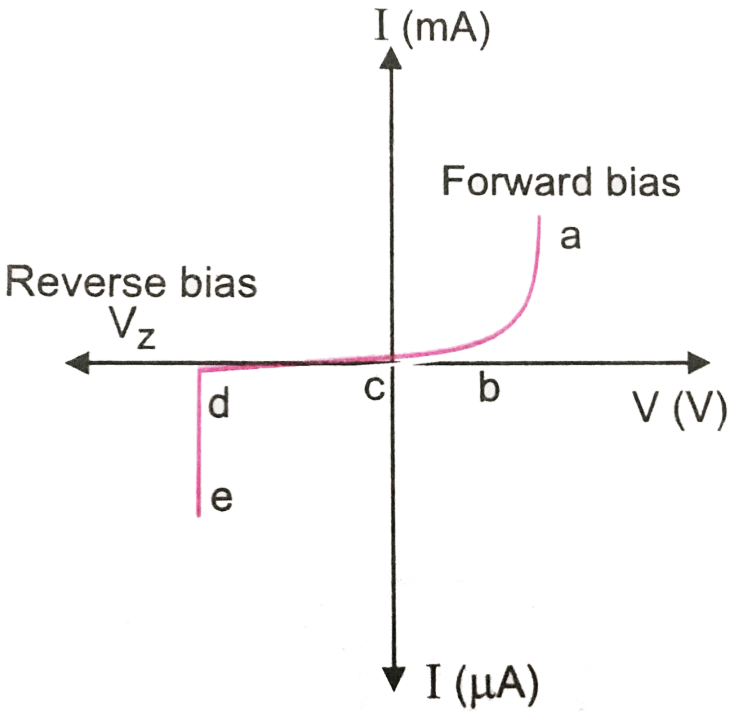
90. The graph shown in Fig. represents the I-V characteristics of a zener diode. Which part of the characteristics curve is

most relevent for its operation as a voltage regular?



A. A, R are true and R explains A correctly

B. A, R are true and R do not explain A correctly

C. A is true, but R is false

D. R is true, but A is false

Answer: D

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91. Assertion (A) : Si and $GaAs$ are preferred materials for solar cells

Reason (R) : Energy gap of Si is $1.1eV$ and that of $GaAs$ is $1.53eV$ which gives maximum irradiance where as other materials like CdS or $CdSe\left(E_g = 2.4eV\right)$ and $PbS\left(E_g = 0.4eV\right)$ given minimum irradiance.

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92. Assertion (A) : Putting p-type semiconductor slabs directly in physical contact can not form $p - n$ junction

Reason (R) : The roughness at contact will be much more than

inter atomic crystal spacing $\left(=2\text{Å} \rightarrow 3\text{Å}\right)$ and continuous flow of charge carriers is not possible.

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93. Assertion (A) : Eventhough forward bias is known to be more (mA) than the current in the reverse bias (μA), photodiodes are still used in reverse bias.

Reason (R) : The fractional change in majority charge carriers woulb be much less than that in minority charge carriers due to photo-effects so that minority carrier reverse bias current is more easily to measure with photo diodes than majority carrier forward current.

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94. The correct relation between current gains α and β is

A. $\beta = \frac{\alpha}{1-\alpha}$

B. $\beta = \frac{\alpha}{1+\alpha}$

C. $\beta = \alpha(1-\alpha)$

D. $\beta = \frac{1-\alpha}{\alpha}$

Answer: A

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95. Transistors are made of.

A. insulators

B. conductors

C. alloys

D. doped semi-conductors

Answer: D

Watch Video Solution

96. In $n-p-n$ transistor the arrow head on emitter represents that the convantional current flows from

A. base to emitter

B. emitter to base

C. emitter to collector

D. base to collector

Answer: A

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97. In a junction transistor the emitter, base and collector are made of.

A. extrinsic semi conductors

B. intrinsic semi conductors

C. both 1 and 2

D. metal

Answer: A

Watch Video Solution

98. In a transistor.

A. both emitter and the collector are equally doped

B. base is more heavily doped than collector

C. collector is more heavily doped than the emitter

D. the base is made very thin and is lightly doped

Answer: D

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99. In a transistor

A. length of emitter is greater than that of collector

B. length of collector is greater than that of emitter

C. both emitter and collector have same length

D. any one of emitter and collector can have greater length

Answer: B

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100. In transistor the emitter current is.

A. slightly more than the collector current

B. slightly less than the collector current

C. equal to the collector current

D. equal to the base current

Answer: A

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101. In the use of transistor as an amplifier

A. the emitter - base junction is revrese biased and the collector base junction is also revrese biased

B. the emitter - base junction is forward biased and the collector -base junction is reverse biased

C. both the junctions are forward biased

D. any of the two junctions may be forward biased

Answer: B

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102. One way in which the operation of an npn transistor differ from that of a pnp transistor is that

A. the emitter junction is reverse biased in npn

B. the emitter junction injects minority carriers into the base region of the pnp.

C. the emitter injects holes into the base of the pnp and electrons into the base region of npn

D. the emitter injects holes into the base of npn.

Answer: C

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103. npn transistors are preferred to pnp transistors because they have

A. low cost

B. low dissipation energy

C. capable of handling large power

D. electrons have high mobility than holes and hence high mobility of energy.

Answer: D

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104. A CE transistor amplifies weak current signal because collector current is.

A. β times I_b

B. β times I_C

C. α times I_b

D. α times I_C

Answer: A

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105. When a positive voltage signal is applied to the base of a common emitter npn amplifier

A. The emitter current decreases

B. The collector voltage becomes more positive

C. The collector voltage becomes less positive

D. The collector current decreases

Answer: C

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106. In case of common emitter $p-n-p$ transistor input characteristic is a graph drawn.

A. With I_C on y-axis and V_{CE} on x-axis keeping I_B constant

B. With I_B on y-axis and V_{BE} on x-axis keeping V_{CE} constant

C. With I_C on y-axis and I_B on x-axis keeping V_{CE} constant

D. With V_{BE} on y-axis and V_{CE} x- axis keeping I_B constant.

Answer: B

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107. The output characterstics of an $n-p-n$ transistor represent, [I_C = Collector current, V_{CE} = potential difference between collector and emitter, I_B = Base current, V_{BB} = voltage given base , V_{BE} = the potential difference between base and emitter].

A. change in I_C as I_B and V_{BB} are changed

B. Changes in I_C with changes in $V_{CE}(I_B = cons\tan t)$.

C. changes in I_B with changes in V_{CE}.

D. Changes in I_C as V_{BE} is changed.

Answer: B

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108. In a transistor the base is made very than and is lightly doped with an impurity, because.

A. to enable the collector to collect about 95% of the holes or electrons coming from the emitter side

B. to enable the emitter to emit small number of holes or electrons

C. to save the transistors from high current effects

D. to enable the base to collect about 95% of holes or electrons coming from the emitter side.

Answer: A

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

A. Both emitter junction and collector junction are forward biased

B. Both emitter junction and collector junction are reverse biased

C. Emitter junction is forward biased and collector junction is rerverse biased

D. Emitter junction is reverse biased and collector junction is forward biased.

Answer: C

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110. An $n-p-n$ transistor power amplifier in $C-E$ configuration gives.

A. Voltage amplification only

B. Current amplification only

C. Both current and voltage amplification

D. Only power gain of unity

Answer: C

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111. When N-P-N transistor is used as an amplifier-

A. electrons move from base to collector

B. holes moves from emitter to base

C. holes move from collector to base

D. holes move from base to emitter

Answer: A

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112. The part of a transistor which is heavily doped to produce a large number of majority carriers, is

A. emitter

B. base

C. collector

D. can be any of the above three

Answer: A

Watch Video Solution

113. When N-P-N transistor is used as an amplifier-

A. electrons move from collector to base

B. holes move from collector to base

C. electrons move from base to emitter

D. holes move from base to emitter

Answer: D

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114. A $n-p-n$ transistor conducts when

A. both collector and emitter are positive when respect to the base

B. collector is positive and emitter is negative with respect to the base

C. collector is positive and emitter is at same potential as the base

D. both collector and emitter are negative with respect to the base

Answer: B

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115. In a common-base amplifier, the phase difference between the input signal voltage and output voltage is :

A. $\frac{\pi}{4}$

B. π

C. zero

D. $\frac{\pi}{2}$

Answer: C

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116. In a common emitter amplifier, the phase difference between the input signal voltage and output voltage is.

A. $\frac{\pi}{2}$

B. 0

C. π

D. $\frac{\pi}{4}$

Answer: C

Watch Video Solution

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

A. Electrons move from emitter to collector

B. Holes move from emitter to base

C. Electrons move from collector to base

D. Holes move from base to collector

Answer: A

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118. In a PNP transistor the base is the N-region. Its width relative to the P-region is

A. smaller

B. larger

C. same

D. not related

Answer: A

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119. A three terminal device with one terminal common to both the output and input is called.

A. rectifier

B. transistor

C. diode

D. triode

Answer: B

Watch Video Solution

120. Input and output signal of an amplifier in CE configuration are always

A. Equal

B. Inphase

C. Having a phase difference

D. Out of phase

Answer: D

Watch Video Solution

121. Ge transistor can be operated at a temperature

A. upto $90^\circ C$

B. upto $40^\circ C$

C. upto $100^\circ C$

D. upto $20^\circ C$

Answer: A

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122. Transistor amplifier circuit with a feed back circuit is called

A. oscillator

B. detector

C. modulator

D. all

Answer: A

Watch Video Solution

123. A pulsating voltage is a mixture of an $a.c$ componet and $a.d.c$ compenent. The circuit used to separate $a.c$ and $d.c$

component is called

A. an oscillator

B. an amplifier

C. a rectifier

D. a filter

Answer: D

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124. The α and β of a transistor are always

A. $\alpha > 1, \beta < 1$

B. $\alpha < 1, \beta > 1$

C. $\alpha = \beta$

D. $\alpha\beta = 1$

Answer: B

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125. In case of NPN transistor, emitter current is always greater than collector current, because :

A. Collector side is revese biased and emitter side is forward biased

B. Collector being reverse biased attracts more electrons

C. Some electrons are lost in base

D. Collector side is forward biased and emitter side is reverse biased.

Answer: C

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126. When a transistor amplifier having current gain of 75 is given an input signal, $V_I = 2\sin(157t + \pi/2)$, the output signal is found to be $V_o = 200\sin(157t + 3\pi/2)$. The transistor is connected as :

A. A common collector amplifier

B. A common base amplifier

C. A common emitter amplifier

D. An oscillator

Answer: C

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127. An oscillator is an amplifier with

A. A large gain

B. Negative oscillator

C. Positive feedback

D. No feedback

Answer: C

Watch Video Solution

128. In which of the transistor configurations, the voltage gain is highest ?

A. Common-base

B. Common-emitter

C. Common-collector

D. Same in all three

Answer: B

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

A. It is a pnp transistor with R as emitter

B. It is an npn transistor with R as collector

C. It is an npn transistor with R as base

D. It is pnp transistor with R as collector.

Answer: D

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130. Common emitter mode of a transistor is wedely used. Current gain, voltage gain, and power gain are maximum in $C.\ E$ mode of a transistors.

A. If both A and R are correct and R is the correct explanation of A

B. If both A and R are correct and R is not the correct explanation of A

C. If 'A' is correct and 'R' is incorrect

D. If 'A' is incorrect and 'R' is correct.

Answer: A

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131. Transistor in $C.E$ mode can be used as amplifier

A small change in base current produces a relatively large change in collector current.

A. If both A and R are correct and R is the correct explanation of A

B. If both A and R are correct and R is not the correct explanation of A

C. If 'A' is correct and 'R' is incorrect

D. If 'A' is incorrect and 'R' is correct.

Answer: A

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132. In the Binary number system the number 100 represents :

A. one

B. three

C. four

D. hundred

Answer: C

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133. Among the following is not the function of NOT gate is

A. stop a signal

B. invert an input signal

C. complement a signal

D. change the logic in a digital circuit

Answer: A

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134. Digital circuit can be made by repetitive use of

A. OR gates

B. AND gates

C. NOT gates

D. $NAND$ gates

Answer: D

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135. Among the following one gives output 1 in the AND gate.

A. $A = 0, B = 0$

B. $A = 1, B = 1$

C. $A = 1, B = 0$

D. $A = 0, B = 1$

Answer: B

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136. Person who use Boolean algebra for describing the operation of logic gates first was

A. Boole

B. Shannon

C. Schottky

D. Zener

Answer: B

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137. $NAND$ and NOR gates are called universal gates because they

A. are universally available

B. can be combined to produce OR, AND and NOT gates

C. are widely used in the Integrated circuits

D. can be easily manufactured

Answer: B

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138. In positive logic, the logic state 1 corresponds to

A. positive voltage

B. zero voltage

C. lower voltage level

D. higher voltage level.

Answer: D

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

A. sum of A and B is Y

B. Y exists when A exists or B exists or both A and B exist

C. Y exists only when A and B both exist

D. Y exists when Aor B exist but not when both A and B exist.

Answer: B

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140. In the Boolean algebra, the following one is wrong

A. $1 + 0 = 1$

B. $0 + 1 = 1$

C. $1 + 1 = 1$

D. $0 + 0 = 1$

Answer: D

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141. In Boolean algebra $A.\ B = Y$ implies that :

A. product of A and B is Y

B. Y exists when A exists or B exists

C. Y exists when both A and B exist but not when only A or B exists

D. Y exists when A or B exists but not both A and B exist.

Answer: C

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142. In the Boolean algebra, the following one is wrong

A. $1.0 = 0$

B. $0.1 = 0$

C. $1.1 = 0$

D. $1.1 = 1$

Answer: C

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143. The following truth table is for

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

.

A. $NAND$ gate

B. AND gates

C. XOR gate

D. NOT gate

Answer: A

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144. The output of a 2-input OR gate is zero only when its

A. both inputs are 0

B. either input is 1

C. both inputs are 1

D. either input is zero

Answer: A

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145. Boolean algebra is essentially based on

A. symbols

B. logic

C. truth

D. numbers

Answer: B

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146. The value of $\overline{A} + A$ in the Boolean algebra is

A. A

B. $\overline{A}$

C. 0

D. 1

Answer: D

Watch Video Solution

147. The value of $A.\ \overline{A}$ in Boolean algebra is.

A. 0

B. 1

C. A

D. $\overline{A}$

Answer: A

Watch Video Solution

148. The following is NOT equal to 0 in the Boolean algebra is

A. $\overline{\overline{A}.0}$

B. $A.\ \overline{A}$

C. $A.0$

D. $\overline{\overline{A}+\overline{A}}$

Answer: A

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149. An AND gate is following by a NOT gate in series. With two inputs A & B, the Boolean expression for the out put Y

will be :

A. $A.B$

B. $A+B$

C. $\overline{A+B}$

D. $\overline{A.B}$

Answer: D

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150. NOR gate is the series combination of

A. NOT gate following by OR gate

B. OR gate following by NOT gate

C. AND gate followed by OR gate

D. OR gate followed by AND gate

Answer: B

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151. The gate that has only one input terminal

A. NOT

B. NOR

C. $NAND$

D. XOR

Answer: A

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152. AND gate :

A. It has no equivalence to switching circuit.

B. It is equivalent to series switching circuit

C. It is equivalent to parallel switching circuit

D. It is mixture of series and parallel switching circuit

Answer: B

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153. The gate that can act as a building block for the digital circuits is

A. OR

B. NOT

C. AND

D. $NAND$

Answer: D

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154. 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 complicated gates.

A. Statement -1 is false, statement -2 is true

B. statement $1-$ is true statement -2 is true statement -2 is correct explanation of statement -1.

C. statement $1-$ is true statement -2 is true statement -2 is not correct explanation of statement -1

D. statement $1-$ is true statement -2 is false.

Answer: B

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155. NOT gate is also called invertor circuit.

NOT gate inverts the input order.

A. Statement -1 is false, statement -2 is true

B. statement $1-$ is true statement -2 is true statement -2 is correct explanation of statement -1.

C. statement $1-$ is true statement -2 is true statement -2 is not correct explanation of statement -1

D. statement $1-$ is true statement -2 is false.

Answer: B

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Level I C W

1. The electrical conductivity of a semiconductor increases when electromagnatic radiation of wavelength shorter than 2480 nm is incident on it. The band gap (in eV) for the semiconductor is $[hc = 1242eVnm]$

A. $0.7eV$

B. $0.5eV$

C. $2.5eV$

D. $1.2eV$

Answer: B

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2. Pure Si at $300K$ has equal electron (n_i) concentrations of $1.5 \times 10^{16} m^{-3}$. Doping by indium increases $n_h = 4.5 \times 10^{22} m^{-3}$. N_e in the doped Si is

A. 5×10^9

B. 7×10^9

C. 9×10^9

D. 8×10^9

Answer: A

View Text Solution

3. In a $p-n$ junction the depletion region is $400nm$ wide and electric field of $5 \times 10^5 Vm^{-1}$ exists in it. The minimum energy of a conduction electron, which can diffuse from n-side to the p-side is.

A. $4eV$

B. $5eV$

C. $0.4eV$

D. $0.2eV$

Answer: D

Watch Video Solution

4. The reverse bias in a junction diode is changed from $5V$ to $15V$ then the value of current changes from $38\mu A$ to $88\mu A$. The resistance of junction diode will be.

A. $4 \times 10^5 \Omega$

B. $3 \times 10^5 \Omega$

C. $2 \times 10^5 \Omega$

D. $10^6 \Omega$

Answer: C

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5. A diode made of silicon has a barrier potential of $0.7V$ and a current of $20mA$ passes through the diode when a battery of $emf3V$ and a resistor is connected to it. The wattage of the resistor and diode are

A. $0.046W, 0.014W$

B. $4.6W, 0.14W$

C. $0.46W, 0.14W$

D. $46W, 14W$

Answer: A

Watch Video Solution

6. In a half wave rectifier output is taken across a $90ohm$ load resistor. If the resistance of diode in forward biased condition is $10ohm$, the efficiency of rectification of ac power into dc power is.

A. $40.6\,\%$

B. $81.2\,\%$

C. $73.08\,\%$

D. $36.54\,\%$

Answer: D

Watch Video Solution

7. In a full wave rectifier output is taken across a load resistor of $800 ohm$. If the resistance of diode in forward biased condition is $200 ohm$, the efficiency of rectification of ac power into dc power is.

A. $64.96\ \%$

B. $40.6\ \%$

C. $81.2\ \%$

D. $80\ \%$

Answer: A

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8. In a $P-N-P$ transistor, the collector current is $10mA$. If $90\,\%$ of the holes reach the collector, then emitter current will be :

A. $13mA$

B. $12mA$

C. $11mA$

D. $10mA$

Answer: C

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9. A transistor has a base current of $1mA$ and emitter current $100mA$. The current transfer ratio will be

A. 0.9

B. 0.99

C. 1.1

D. 10.1

Answer: B

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10. When base -emitter voltage of a transistor connected in the common-emitter mode is changed by $20mV$ the collector current is changed by $25mA$. Find the transconductance.

A. $1.25\Omega^{-1}$

B. $2.50\Omega^{-1}$

C. $0.5\Omega^{-1}$

D. $5.5\Omega^{-1}$

Answer: A

Watch Video Solution

11. In a transistor circuit the base current changes from $30\mu A$ to $90\mu A$. If the current gain of the transistor is 30, the change in the collector current is.

A. $4mA$

B. $2mA$

C. $3.6mA$

D. $1.8mA$

Answer: D

Watch Video Solution

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

A. 40

B. 41

C. 42

D. 43

Answer: B

Watch Video Solution

13. In a common base configuration the emitter current changes by $5mA$ when emitter voltage is changed by $200mV$ at a fixed collector to base voltage. The input resistance is.

A. 40Ω

B. 1000Ω

C. 2.5Ω

D. 4Ω

Answer: A

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14. For a common base amplifier, The values of resistance gain and voltage gain are 3000 and 2800 respectively. The current gain will be.

A. 0.93

B. 0.83

C. 0.73

D. 0.63

Answer: A

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15. In a transistor amplifier $\beta = 62$, $R_L = 5000\Omega$ and internal resistance of the transistor is 500Ω. Its power amplification will be.

A. 25580

B. 33760

C. 38440

D. 55280

Answer: C

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16. Decimal number 15 is equivalent to the binary number :

A. 110001

B. 000101

C. 101101

D. 001111

Answer: D

Watch Video Solution

17. Binary number 1001001 is equivalent to the decimal number :

A. 37

B. 73

C. 41

D. 32

Answer: B

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18. In the Binary number system $1 + 1 =$

A. 2

B. 1

C. 10

D. 100

Answer: C

Watch Video Solution

19. If $A = B = 1$, then in terms of Boolean algebra the value of $A.\ B + A$ is not equal to.

A. $B.\ A + B$

B. $B + A$

C. B

D. $\overline{A}.\ B$

Answer: D

Watch Video Solution

20. In the Bollean algebra, the following one which is not equal to A is.

A. $A.A$

B. $A + A$

C. $\overline{A}.A$

D. $\overline{\overline{A} + \overline{A}}$

Answer: C

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21. The logic expression which is NOT true in Boolean algebra is.

A. $\left(\bar{1}+\bar{1}\right).1=0$

B. $\left(\bar{1}+0\right).1=0$

C. $\left(\bar{1}+0\right).\bar{1}=0$

D. $(1+1).1=0$

Answer: D

Watch Video Solution

Level Ii C W

1. Mobilities of electrons and holes in a sample of intrinsic germanium at room temperature are $0.36m^2/Vs$ and

$0.17m^2/Vs$. The electron and hole densities are each equal to $2.5 \times 10^{19}m^{-3}$. The electrical conductivity of germanium is.

A. $0.47S/m$

B. $5.18S/m$

C. $2.12S/m$

D. $1.09S/m$

Answer: C

Watch Video Solution

2. In a $p-n$ junction diode the thickness of deplection layer is $2 \times 10^{-6}m$ and barrier potential is $0.3V$. The intensity of the electrical field at the junction is.

A. $0.6 \times 10^{-6}Vm^{-1}$ from n to p side

B. $0.6 \times 10^{-6} Vm^{-1}$ from p to n side

C. $1.5 \times 10^{5} Vm^{1}$ from n to p side

D. $1.5 \times 10^{5} Vm^{-1}$ from p to n side.

Answer: C

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3. A potential barrier V volts exists across a $P-N$ junction. The thickness of the depletion region is 'd'. An electron with velocity 'v' approches $P-N$ junction from N-side. The velocity of the electron acrossing the junction is.

A. $\sqrt{v^2 + \frac{2Ve}{m}}$

B. $\sqrt{v^2 - \frac{2Ve}{m}}$

C. v

D. $\sqrt{\frac{2Ve}{m}}$

Answer: B

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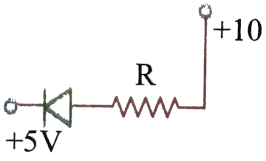
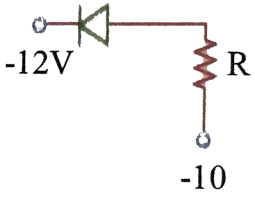
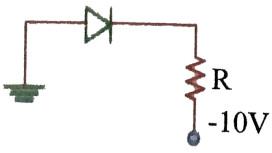
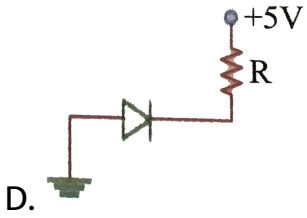
4. In the following, reverse biased diode is.

A. 

B. 

C. 



Answer: D

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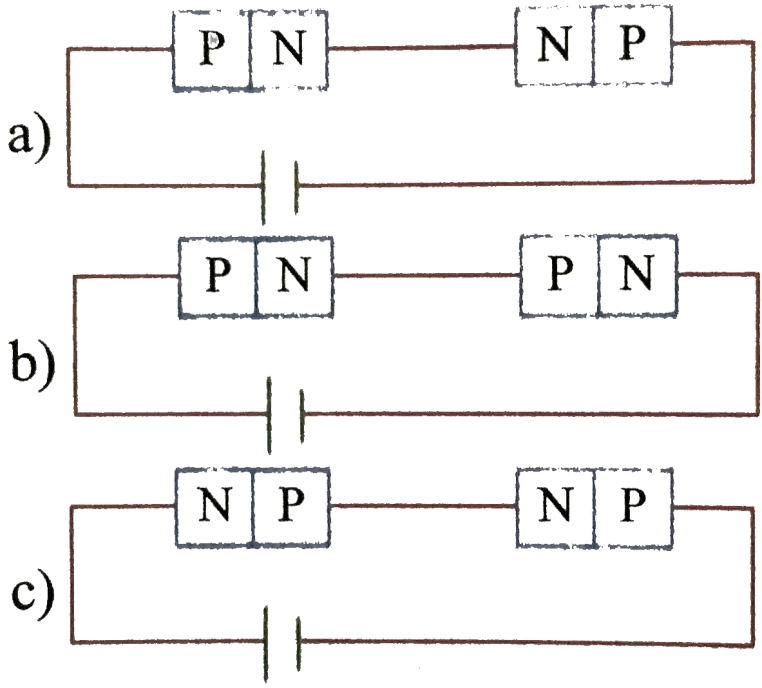
5. Two similar $p-n$ junctions can be connected in three different ways as shown in the figure. The two connections

across which the potentional difference is same are.



(a)

A. circuit a and b

B. circuit b and c

C. circuits a and c

D. all the circuits

Answer: B

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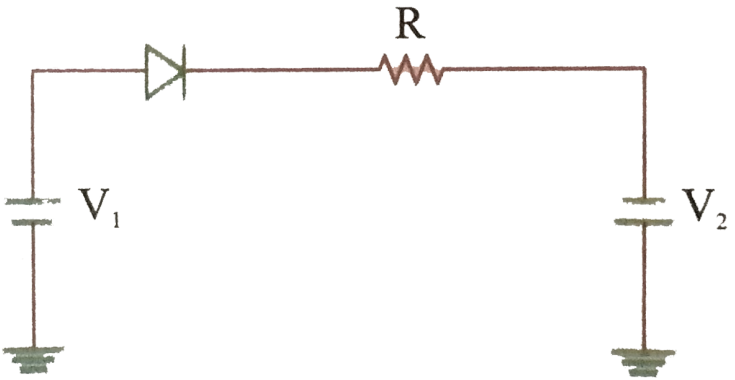
6. If $V_1 > V_2, r$ is resistance offered by diode in forward bias then current through the diode is.



A. 0

B. $\frac{V_1 + V_2}{R + r}$

C. $\frac{V_1 - V_2}{R + r}$

D. None

Answer: B

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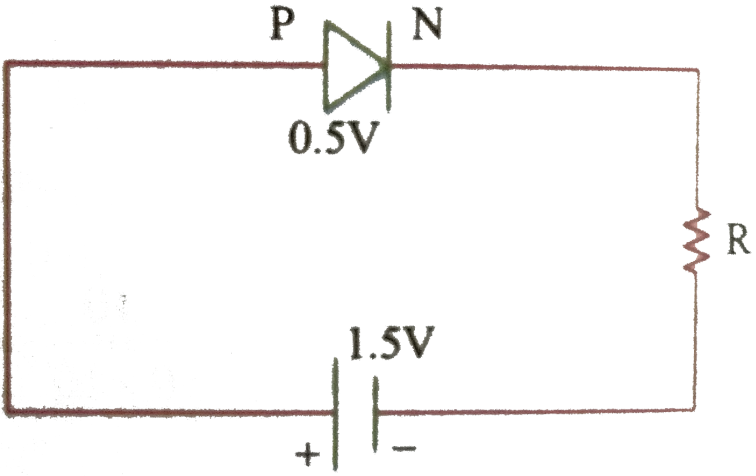
7. A PN junction diode when forward biased has a drop of $0.5V$ which is assumed to be independent of current. The current in excess of $10mA$ through the diode produces large joule heating which damages the diode. If we diode, the resistor used in series with the diode so that the maximum current does not exceed $5mA$ is.



A. $2 \times 10^2\Omega$

B. $2 \times 10^5 \Omega$

C. $2 \times 10^3 \Omega$

D. $2 \times 10^4 \Omega$

Answer: A

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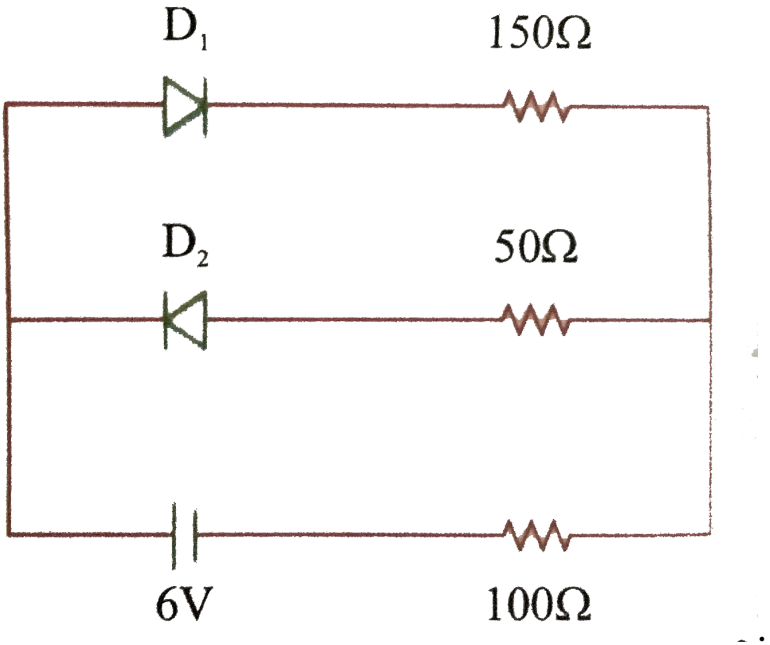
8. The circuit shown in figure (1) Contains two diodes each with a forward resistance of $50 ohm$ and with infinite reverse resistance. If the battery voltage is $6V$, the current through

the $100 ohm$ resistance is.



A. $0.01A$

B. $0.02A$

C. $0.03A$

D. $0.04A$

Answer: B

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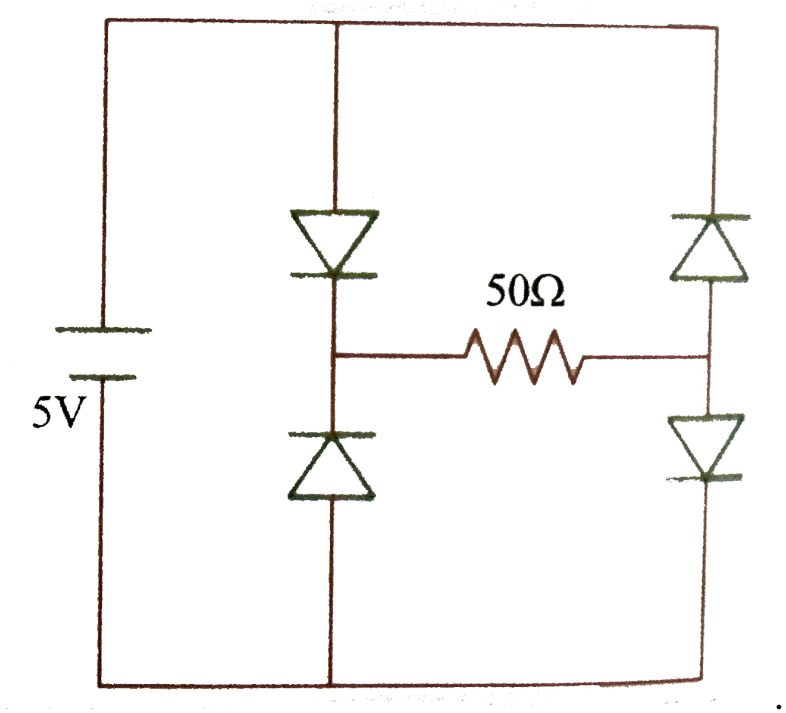
9. 4 ideal diodes are connected as shown in the circuit the current through 50Ω is.



A. $0.1A$

B. $0.5A$

C. $0.6A$

D. $1A$

Answer: A

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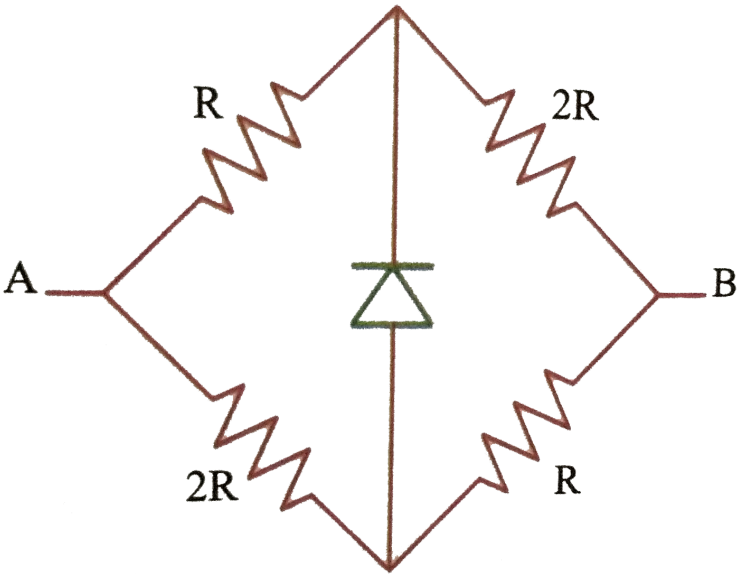
10. Find the effective resistance between A & B



A. $\frac{2}{3R}$

B. $\frac{3R}{2}$

C. $\frac{2R}{2}$

D. R

Answer: B

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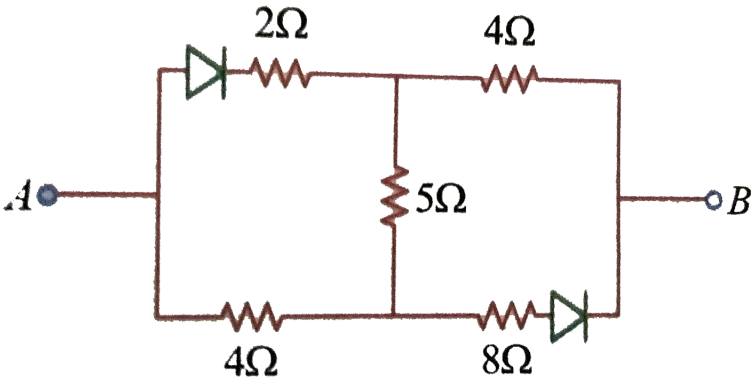
11. The equivalent resistance of the circuit across AB is given by



A. 4Ω

B. 13Ω

C. 4Ω or 13Ω

D. 4Ω or zero

Answer: C

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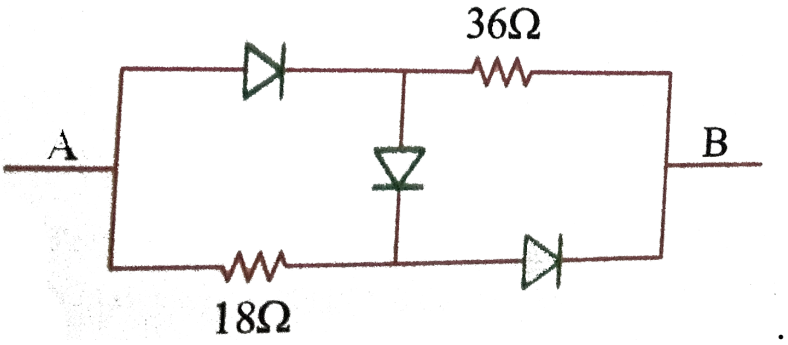
12. The equivalent resistance between A and B is



A. 36Ω if $V_A > V_B$

B. 18Ω if $V_A < V_B$

C. Zero if $V_A < V_B$ and 54Ω if $V_A > V_B$

D. Zero if $V_A > V_B$ and 54Ω If $V_A < V_B$

Answer: D

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13. A junction diode is connected to a $10V$ source and $10^3\Omega$ rheostat. The slope of load line on the characteristic curve of diode by $(\text{in}A/V)$.

A. 10^{-1}

B. 10^{-2}

C. 10^{-3}

D. 10^{-4}

Answer: C

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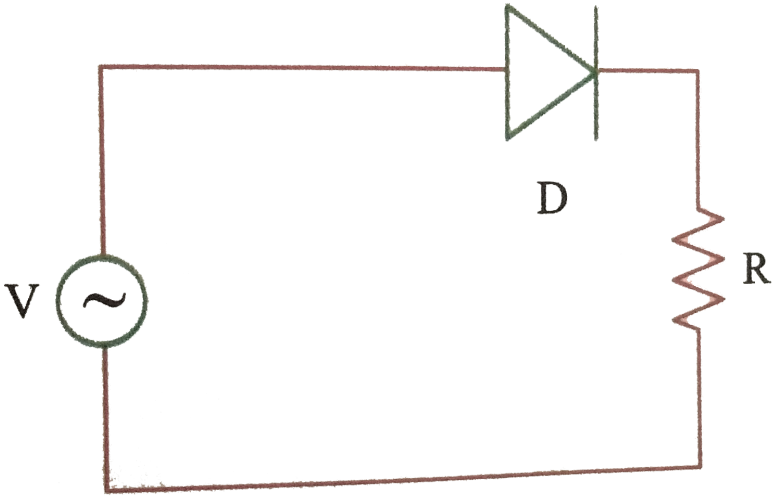
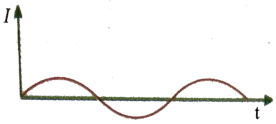
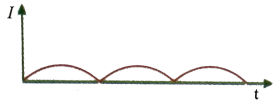
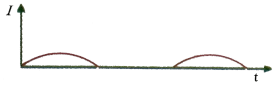
14. A $p-n$ junction (D) shown in the figure can act as a rectifier. An alternating current source (V) is connected in the circuit.



A. 

B. 

C. 

D. 

Answer: C

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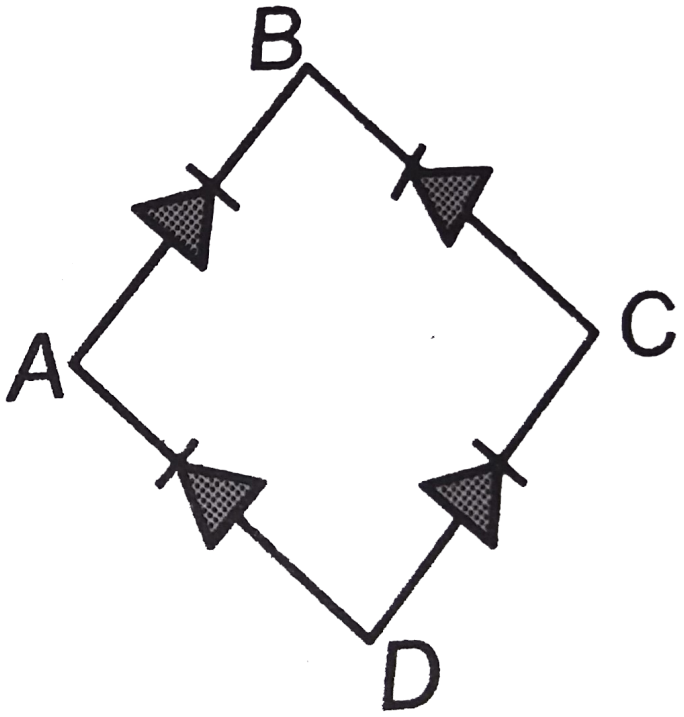
15. In the diagram, the input is across the terminals A and C and the output is across the terminals B and D, then the

outputs is



A. Zero

B. Same as the input

C. Full wave rectified

D. Half-wave rectified

Answer: C

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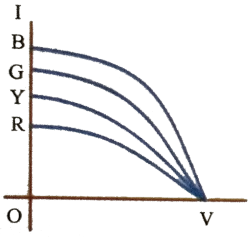
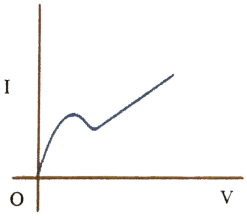
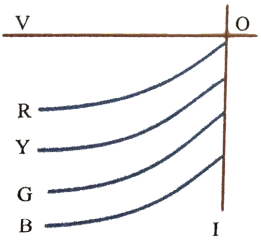
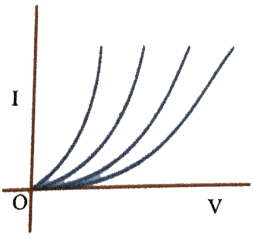
16. The $I - V$ characteristic of an LED is.

A. 

B. 

C. 

D. 

Answer: D

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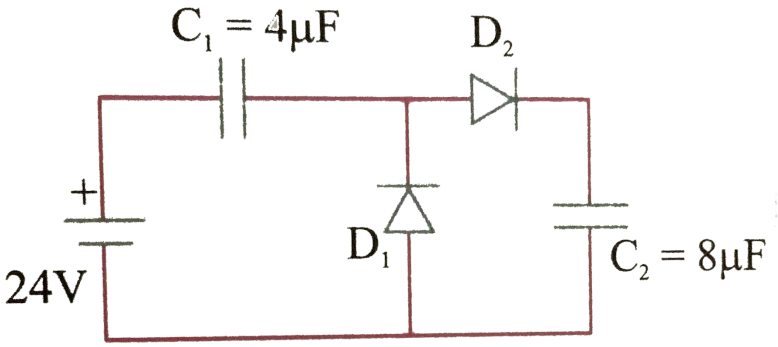
17. In the circuit shown. The potential drop across each capacitor is (assuming the two diodes are ideal).



A. 12 V,12 V

B. 16 V,8 V

C. zero, 24 V

D. 8 V, zero

Answer: B

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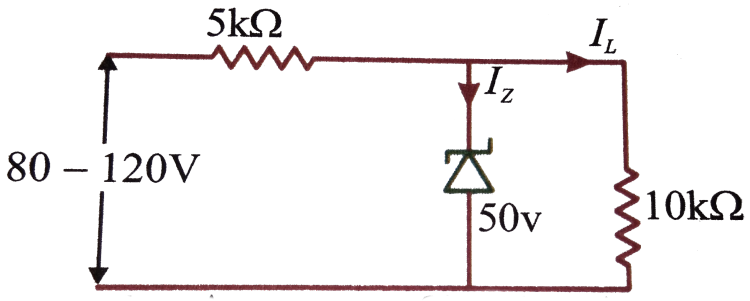
18. The maximum and minimum values of zener diode current are



A. 6mA,5mA

B. 14mA,5mA

C. 9mA,1mA

D. 3mA,2mA

Answer: C

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19. In an n-p-n transistor circuit, the collector current ia 10 mA.

If 90% of the electrons emitted reach the collector.

A. the emitter current, the will be $9mA$

B. the base current will be $1mA$

C. the emitter current will be $11mA$

D. both 2 & 3

Answer: D

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20. The constant α of a transistor is 0.9 What would be the change in the collector current corresponding to a change of $4mA$ in the base current in a common emitter arrangement ?

A. $30mA$

B. $63mA$

C. $36mA$

D. $3.6mA$

Answer: C

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21. A voltage amplifier operated from a 12volt battery has a collector load $6k\Omega$. Calculate the maximum collector current in the circuit.

A. $0.5mA$

B. $1mA$

C. $3mA$

D. $2mA$

Answer: D

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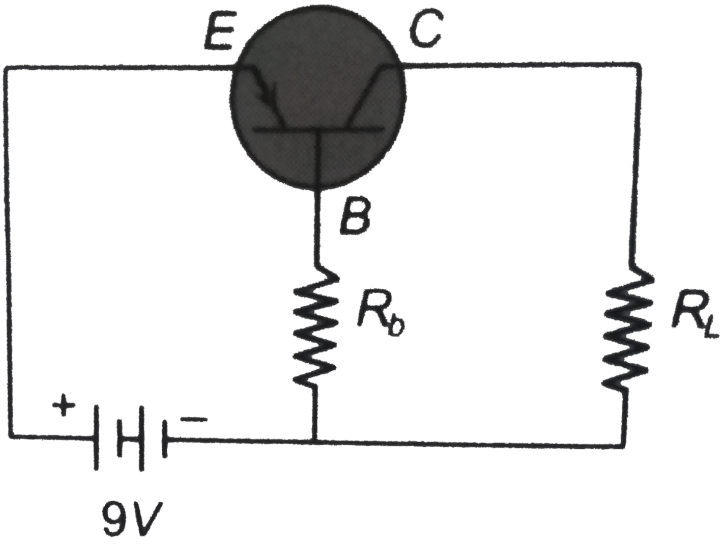
22. In a transistor circuit shown here the base current is $35\mu A$. The value of the resistor R_b is



A. $124k\Omega$

B. $257k\Omega$

C. $352k\Omega$

D. None of these

Answer: B

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23. In a single state transistor amplifier, when the signal changes by $0.02V$ the base current by $10\mu A$ and collector current by $1mA$. If collector load $R_C = 2k\Omega$ and $R_L = 10k\Omega$, Calculate :

(i) Current Gain

(ii) Input Impedance,

(iii) Effective AC load,

(iv) Voltage gain and

(v) Power gain.

A. $50, 2k\Omega, 1.66k\Omega, 83, 8300$

B. $100, 1k\Omega, 1.66\Omega, 83, 8300$

C. $100, 2k\Omega, 1.66k\Omega, 83, 830$

D. $100, 2k\Omega, 1.66k\Omega, 83.8300$

Answer: D

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24. On subtracting 010101 from 101010, we get :

A. 001011

B. 001100

C. 010101

D. 011111

Answer: C

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25. The minimum number of gates required to realise this expression $Z = DABC + DA\overline{BC}$ is.

A. One

B. Two

C. Eight

D. Five

Answer: A

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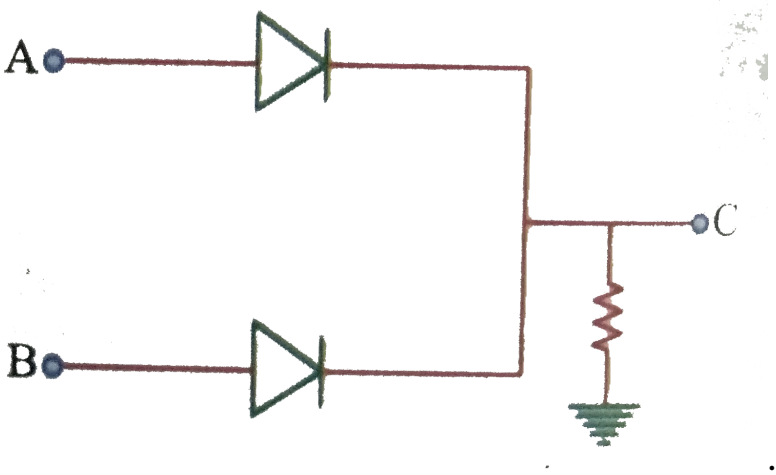
26. In the circuit below, A and B represents two inputs and C represents the output, the circuit represents.



A. NOR gate

B. AND gates

C. $NAND$gate

D. ORgate

Answer: D

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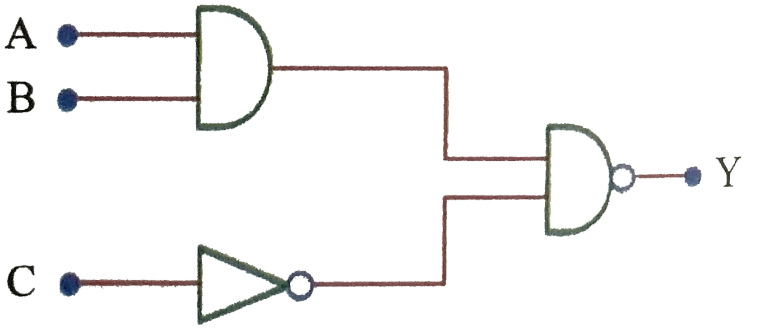
27. In the following circuit the output Y becomes zero for the inputs



A. $A = 1, B = 0, C = 0$

B. $A = 0, B = 1, C = 1$

C. $A = 0, B = 0, C = 0$

D. $A = 1, B = 1, C = 0$

Answer: D

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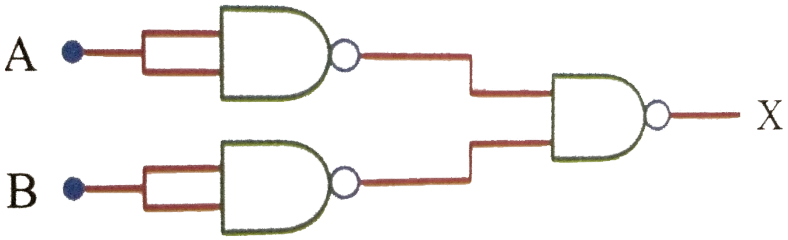
28. The combination of gates shown below yields



A. $NAND$ gate

B. OR gate

C. NOT gates

D. XOR gate

Answer: B

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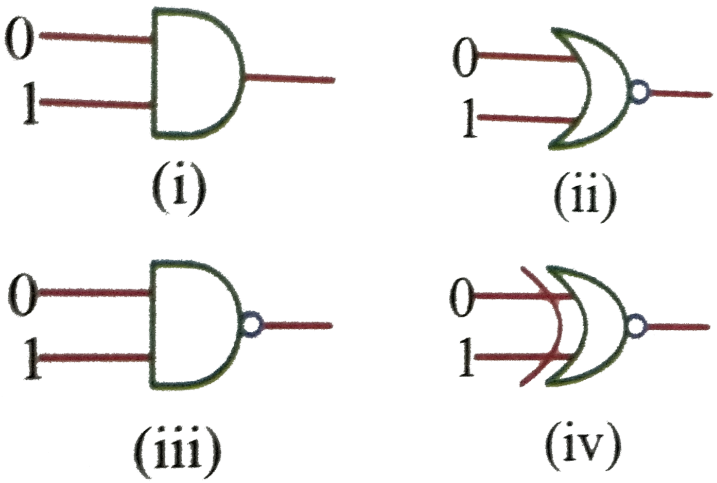
29. The logic gate having an output of 1 is.



(i)

A. (iv)

B. (i)

C. (ii)

D. (iii)

Answer: D

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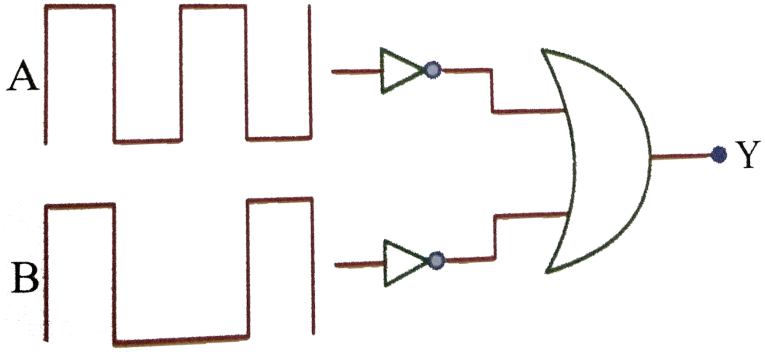
30. In a given circuit as shown the two input wave forms A and B are applied simultaneously.



The resultant wave format at Y is.

A.

B.

C.

D. 

Answer: A

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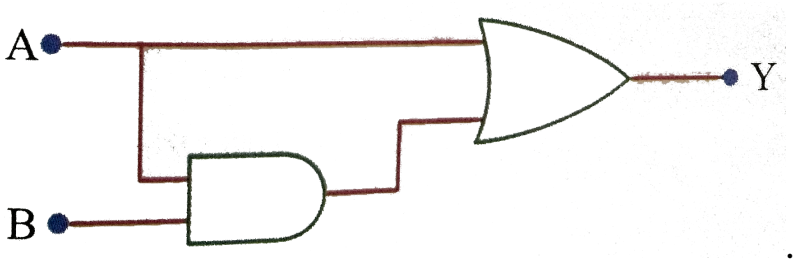
31. The output of the combination of the gates shown in the figure below is



A. $A + A.B$

B. $(A + B)A + \overline{B}$

C. $(A.B) + (\overline{A}.\overline{B})$

D. $(A+B)(\overline{A.B})$

Answer: A

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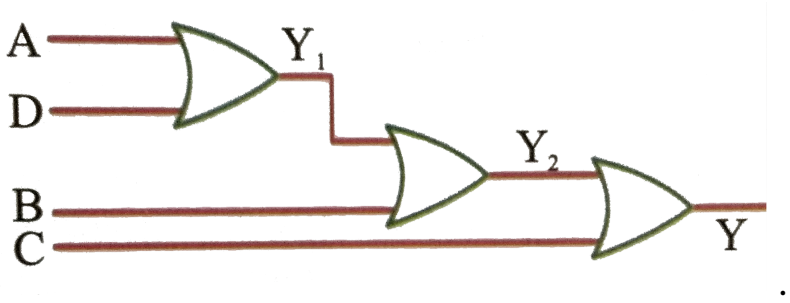
32. The expression of Y in following circuit is



A. $ABCD$

B. $A+BCD$

C. $A+B+C+D$

D. $AB+CD$

Answer: C

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33. How many $NAND$ gate are used to from AND gate?

A. four

B. two

C. three

D. Five

Answer: C

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Level Iii C W

1. If the ratio of the concentration of electron to that of holes in a semiconductor is $\frac{7}{5}$ and the ratio of current is $\frac{7}{4}$ then what is the ratio of their drift velocities ?

A. $5/8$

B. $4/8$

C. $5/4$

D. $4/7$

Answer: C

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2. If the resistivity of copper is $1.7 \times 10^{-6} \Omega cm$, then the mobility of electrons in copper, if each atom of copper

contributes one free electron for conduction, is [The amomic weight of copper is 63.54 and its density is $8.96g/cc$] :

A. $23.36cm^2/Vs$

B. $503.03cm^2/Vs$

C. $43.25cm^2/Vs$

D. $88.0cm^2/Vs$

Answer: C

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3. A pure silicon crystal of length $l(0.1m)$ and area $A\left(10^{-4}m^2\right)$ has the mobility of electron (μ_e) and holes (μ_h) as $0.135m^2/Vs$ and $0.48m^2/Vs$, respectively, If the voltage applied across it is $2V$ and the intrinsic charge concen-tration

it is $2V$ and the intrinsic charge concen-tration is $n_i = 1.5 \times 10^6 m^{-3}$, then the total current flowing through the crystal is.

A. $8.78 \times 10^{17} A$

B. $6.25 \times 10^{-17} A$

C. $7.89 \times 10^{-17} A$

D. $2.456 \times 10^{-17} A$

Answer: A

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4. Find the current produced at room temperature in a pure germanium plate of area $2 \times 10^{-4} m^2$ and of thickness $1.2 \times 10^{-3} m$ when a potential of $5V$ is applied across the

faces. Concentration of carries in germanium at room temperature is 1.6×10^6 per cubic metre. The mobilities of electrons and holes are $0.4 m^2 V^{-1} s^{-1}$ and $0.2 m^2 V^{-1} s^{-1}$ respectively. The heat energy generated in the plate in 100 second is.

A. $2.4 \times 10^{-11} J$

B. $3.4 \times 10^{-11} J$

C. $5.4 \times 10^{-11} J$

D. $6.4 \times 10^{-11} J$

Answer: D

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5. An n-type semiconductor has impurity level $20meV$ below the conduction band. In a thermal collision, transferble enegry is KT. The value of T for which electrons start to jump in conduction bond is :

A. 232 K

B. 348 K

C. 400 K

D. 600 K

Answer: A

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6. Assume that the number of hole-electron pair in an intrinsic semiconductor is proportional to $e^{-\Delta E/2KT}$. Here ΔE = energy gap and $k = 8.62 \times 10^{-5} eV/\text{kelvin}$

The energy gap for silicon is $1.1eV$. The ratio of electron hole pairs at $300K$ and $400K$ is :

A. $e^{-5.31}$

B. e^{-5}

C. e

D. e^2

Answer: A

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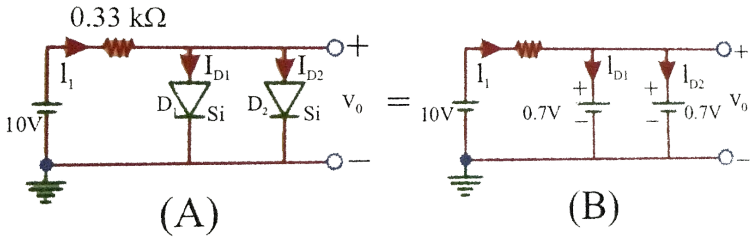
7. In the circuit shown in figure (1), the V_0, I_1, I_{D_1}, and I_{D_3} are respectively.



(A)

A. $0.5V$, $25mA$, $15mA$

B. $0.7V$, $28mA$, $14.09mA$

C. $0.4V$, $15mA$, $20mA$

D. $0.3V$, $15.06mA$, $20.18mA$

Answer: B

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8. For a junction diode, the ratio of forward current $\left(I_f\right)$ and reverse current is.

[I_e = electronic charge,

V = voltage applied across junction,

k = Boltzmann constant

T = temperature in kelvin].

A. $e^{-v/kT}$

B. $e^{V/kT}$

C. $\left(e^{eV/kT}\right)$

D. $\left(e^{V/kT}-1\right)$

Answer: C

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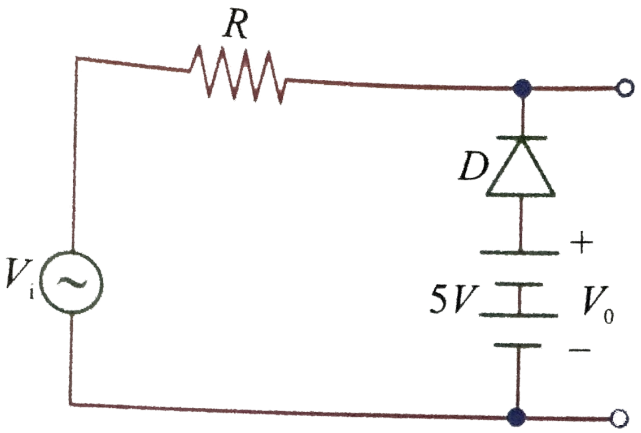
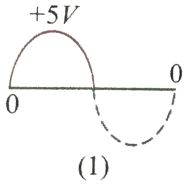
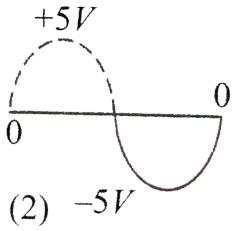
9. In the diagram D an ideal diode and an alternating voltage of peak value $10V$ is connected as input V_1. Which of the following diagram represents the correct wavelength of output voltage V_θ ?



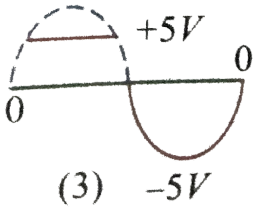
A.



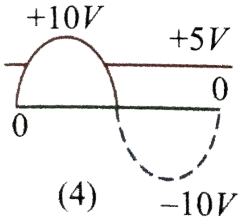
B.



C.



D.



Answer: D

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10. For a CE-transistor amplifier, the audio signal voltage across the collector resistance of $2k\Omega$ is $2V$. Suppose the current amplification factor of the transistor is 100. Find the input signal voltage and base current, if the base resistance is $1k\Omega$.

A. $0.02V$

B. $0.01V$

C. $0.03V$

D. $0.04V$

Answer: B

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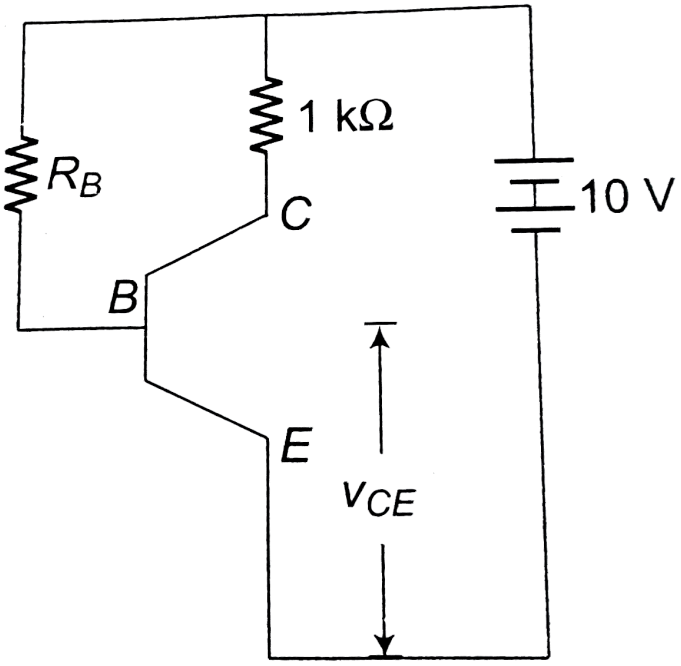
11. In the cuircuit shown here the transistor used has a current gain $\beta = 100$. What should be the bias resistor R_{BE} so that

$V_{CE} = 5V(\text{neglect } V_{BE})$



A. $200k\Omega$

B. $1k\Omega$

C. $500k\Omega$

D. $2k\Omega$

Answer: A

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12. An n - p- n transistor is connected in common - emitter configuraration in which collector supply is 8 V and the voltage drop across the load resistance of 800Ω connected in the collector circuit is 0.8 V . If current amplification factor is 25 , determine collector - emitter voltage and base current . If the internal resistance of the transistor is 200Ω , calculate the voltage gain and the power gain.

A. $5.2V, 1.86, 3$

B. $6.2V, 186, 5.5$

C. $7.2V, 3.86, 3.698$

D. $8.2V, 4.91, 3.15$

Answer: C

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13. For a CE transistor amplifier, the audio signal voltage across the collector resistance of $2k\Omega$ is $2V$. Suppose the current amplification factor of the transistor is 100. The value of R_B in series with V_{BB} supply of $2V$, if the DC base current has to be 10 times the signal current is.

A. $4k\Omega$

B. $14k\Omega$

C. $28k\Omega$

D. $54k\Omega$

Answer: B

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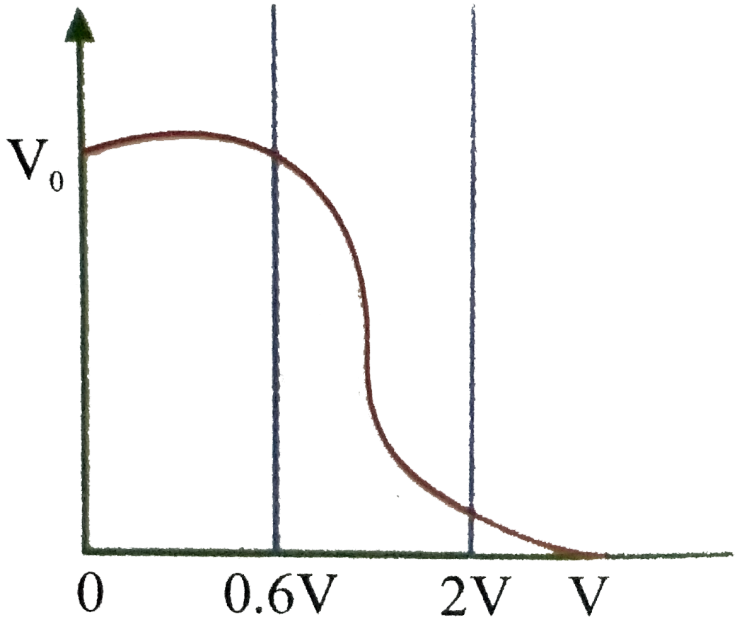
14. Figure shows the transfer characteristics of a base biased CE transistor. Which of the following statements are true ?



(A) At $V_1 = 0.14V$ transistors is in active state

(B) At $V_1 = 1V$ it can be used as an amplifier

(C) At $V_1 = 0.5V$, it can be used as a switch turned off

(D) At $V_1 = 2.5V$, it can be used as switch turned on

A. A, B, C

B. B, C, D

C. A, C, D

D. A, B, D

Answer: B

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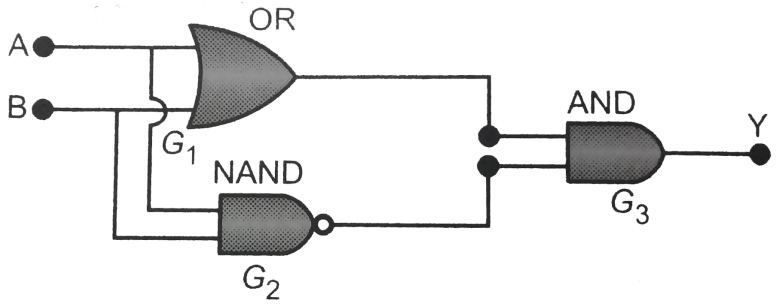
15. The following configuration of gate is equivalent to



A. $NAND$ gate

B. XOR gate

C. OR gate

D. NOR gate

Answer: B

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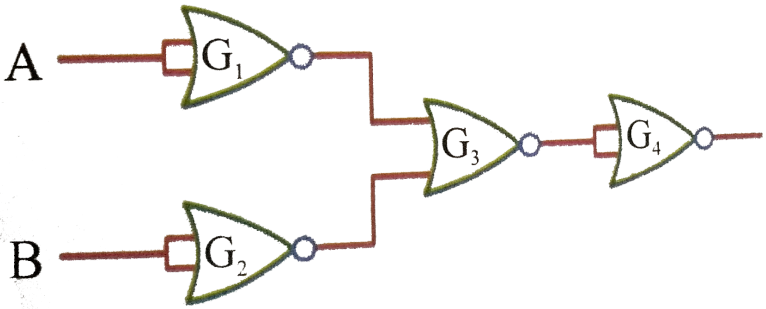
16. The combination of the gates shown below produces



A. AND gate

B. XOR gate

C. NOR gate

D. $NAND$ gate

Answer: D

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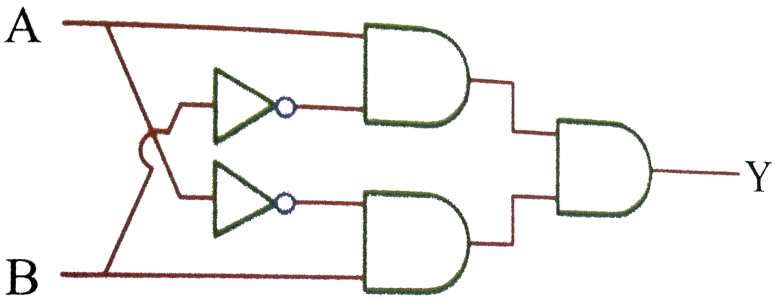
17. Which of the following truth tables is true ?



A.

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

B.

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

C.

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

D.

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

Answer: A

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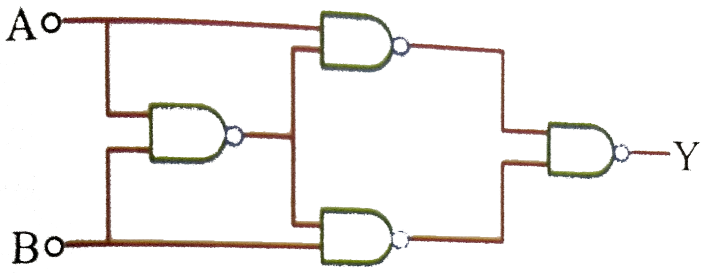
18. Truth table for system of four $NAND$ gates as shown in figure is :



A.

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

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	0
1	1	0

D.

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

Answer: A

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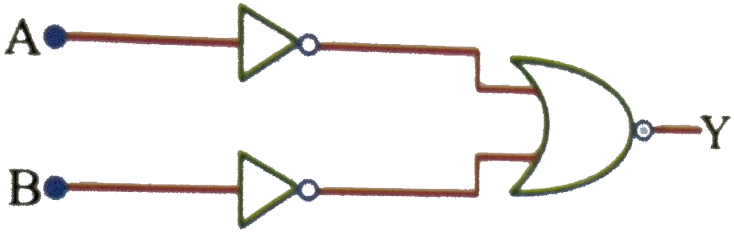
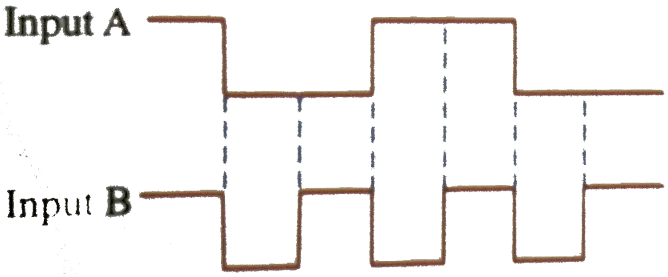
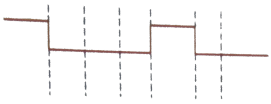
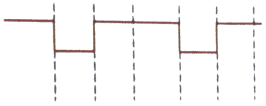
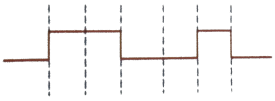
19. The logic circuit shown below has the input waveforms 'A' and 'B' as shown. Pick out the correct output waveform

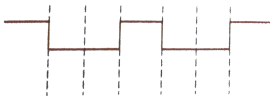




A. 

B. 

C. 

D. 

Answer: A

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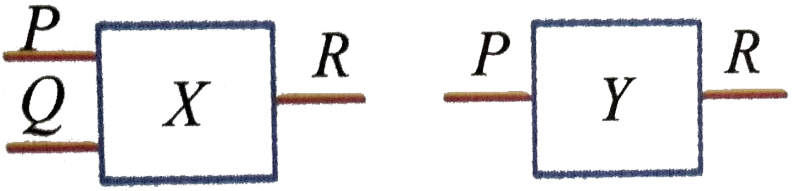
20. Logic gates X and Y have the truth tables shown below



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

When the output of X is connected to the input of Y, the resulting combination is equivalent to a single.

A. NOT gate

B. OR gate

C. NOR gate

D. $NAND$ gate

Answer: D

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Ncert Comprehension

1. A block of pure silicon at $300K$ has a length of $10cm$ and an area of $1.0cm^2$. A battery of emf $2V$ is connected across it. The mobility of electron is $0.14m^2v^{-1}S^{-1}$ and their number density is $1.5 \times 10^{16}m^{-3}$. The mobility of holes is $0.05m^2v^{-1}S^{-1}$.

The electron current is

A. $6.72 \times 10^{-4} A$

B. $6.72 \times 10^{-5} A$

C. $6.72 \times 10^{-6} A$

D. $6.72 \times 10^{-7} A$

Answer: D

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2. A block of pure silicon at $300K$ has a length of $10cm$ and an area of $1.0cm^2$. A battery of emf $2V$ is connected across it. The mobility of electron is $0.14m^2v^{-1}S^{-1}$ and their number density is $1.5 \times 10^{16}m^{-3}$. The mobility of holes is $0.05m^2v^{-1}S^{-1}$.

The hole current is

A. $2.0 \times 10^{-7} A$

B. $2.2 \times 10^{-7} A$

C. $2.4 \times 10^{-7} A$

D. 2.6

Answer: C

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3. A block of pure silicon at $300K$ has a length of $10cm$ and an area of $1.0cm^2$. A battery of emf $2V$ is connected across it. The mobility of electron is $0.14m^2v^{-1}S^{-1}$ and their number density is $1.5 \times 10^{16}m^{-3}$. The mobility of holes is $0.05m^2v^{-1}S^{-1}$.

The total current in the block is

A. $2.4 \times 10^{-7} A$

B. $6.72 \times 10^{-7} A$

C. $4.32 \times 10^{-7} A$

D. $9.12 \times 10^{-7} A$

Answer: D

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4. The input and output resistances in a common base amplifier circuits are 400Ω and $400K\Omega$ respectively. The emitter current is $2mA$ and current gain is 0.98.

The collector current is

A. $1.84mA$

B. $1.96mA$

C. $1.2mA$

D. $2.04mA$

Answer: B

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5. The input and output resistances in a common base amplifier circuits are 400Ω and $400K\Omega$ respectively. The emitter current is $2mA$ and current gain is 0.98.

The base current is

A. $0.012mA$

B. $0.022mA$

C. $0.032mA$

D. $0.042mA$

Answer: D

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6. The input and output resistances in a common base amplifier circuits are 400Ω and $400K\Omega$ respectively. The emitter current is $2mA$ and current gain is 0.98.

Voltage gain of transistor is

A. 960

B. 970

C. 980

D. 990

Answer: C

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7. The input and output resistances in a common base amplifier circuits are 400Ω and $400K\Omega$ respectively. The emitter current is $2mA$ and current gain is 0.98.

Power gain of tranistor is

A. 950

B. 960

C. 970

D. 980

Answer: B

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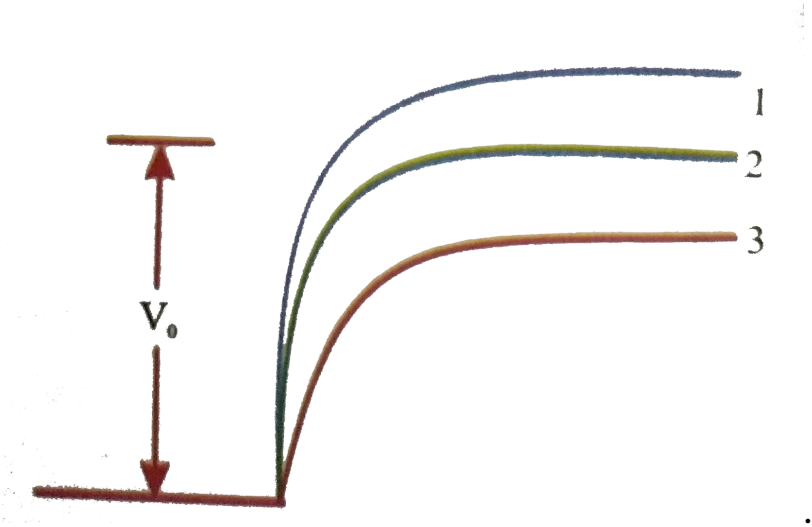
8. In Fig. V_0 is the potential barrier across a $p-n$ junction, when no battery is connected across the junction :



A. 1 and 3 both correspond is forward bias of junction

B. 3 corresponds to forward bias of junction and 1 corresponds to reverse bias junction

C. 1 corresponds to forward bias and 3 corresponds to reverse bias junction

D. 3 and 1 both correspond to reverse bias and 3 corresponds to revers bias of junction

Answer: B

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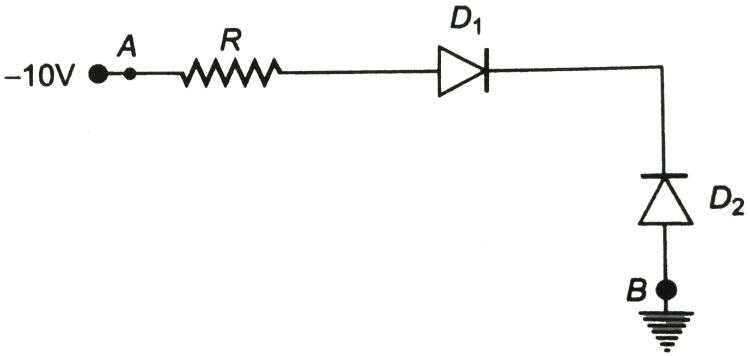
9. In figure , assuming the diodes to be ideal ,



A. D_1 is forward biased and D_2 is reverse biased and hence current flows from A to B

B. D_2 is forward biased and D_1 is reverse biased and hence no current flows from B to A and vice versa

C. D_1 and D_2 are both forward biased and hence current flows form A to B

D. D_1 and D_2 are both revrese biased and hence no current flows from A and B and vica-versa.

Answer: B

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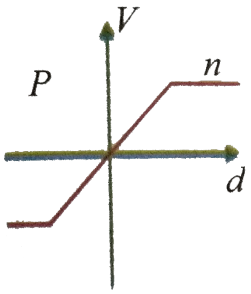
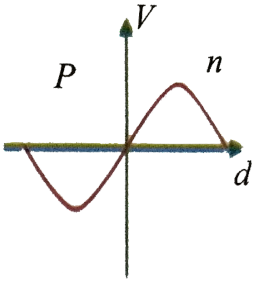
10. The correct curve between potential (V) and distance (d) near $p-n$ junction is.

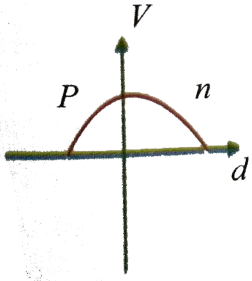
A.



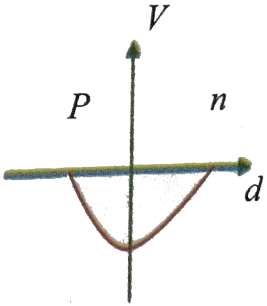
B.



C.



D.



Answer: A

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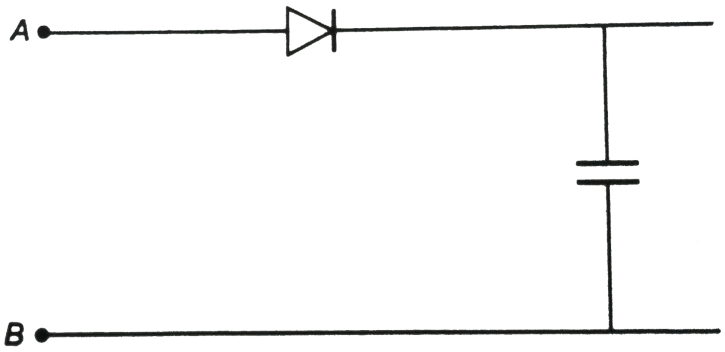
11. A 220 V AC supply is connected between points A and B .

What will be the potential difference V across the capacitor ?



A. 220 V

B. 110 V

C. 0 V

D. 220 V

Answer: D

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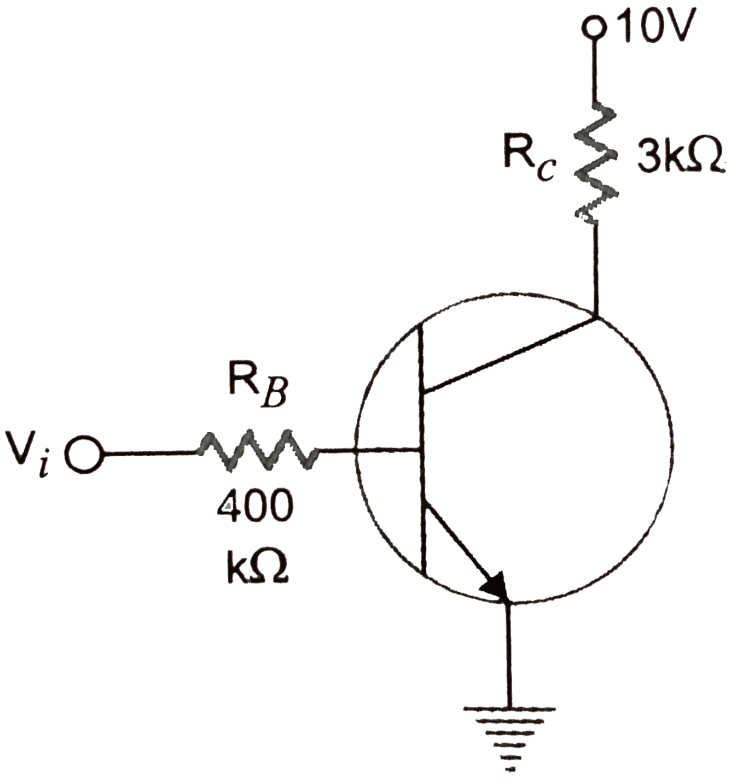
12. In the circuit shown in Fig. when the input voltage of the base resistance is $10V$, V_{be} is zero and V_{ce} is also zero. Find the values of I, I and β.



A. $25\mu A, 3.33mA$

B. $20\mu A, 3.33mA$

C. $20\mu A, 1.33mA$

D. $25\mu A, zero$

Answer: A

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13. In the above problem the current amplification factor β is

A. 83

B. 100

C. 133

D. 203

Answer: C

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Level I H W

1. The electrical conductivity of a semiconductor increases when electromagnetic radiation of wavelength shorter than $1240nm$ is incident on it. The forbidden band energy for the semi conductor is (in eV).

A. 0.5

B. 0.97

C. 0.7

D. 1.1

Answer: B

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2. A semiconductor is known to have an electron concentration of $5 \times 10^{13} / cm^3$ and hole concentration of $8 \times 10^{12} / cm^3$. The semiconductor is

A. n-type

B. p-type

C. intrinsic

D. insulator

Answer: A

Watch Video Solution

3. A potential barrier of $0.50V$ exists a $p-n$ junction. If the width of depletion layer is $10^6 m$, then intensity of electric field in this region will be

A. $1 \times 10^6 V/m$

B. $5 \times 10^5 V/m$

C. $4 \times 10^4 V/m$

D. $2 \times 10^6 V/m$

Answer: B

Watch Video Solution

4. A $p-n$ junction diode has breakdown voltage of $28V$. If applied external in reverse bias is $40V$ the current through it is

A. Zero

B. infinite

C. $10A$

D. $15A$

Answer: B

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5. The value of current in the following diagram is (diode assumed to be ideal one)

A. $0.1amp$

B. $0.01amp$

C. $1amp$

D. zero

Answer: D

Watch Video Solution

6. A half-wave rectifier is used to convert $50HzA.C.$ to $D.C$ voltage. The number of pulses per second in the rectified voltage are

A. 50

B. 25

C. 100

D. 75

Answer: A

Watch Video Solution

7. If a full wave rectifier circuit is operating from $50Hz$ mains, the fundamental frequency in the ripple will be

A. $25Hz$

B. $50Hz$

C. $70.7Hz$

D. $100Hz$

Answer: D

Watch Video Solution

8. In an npn transistor the base the collector currents are $100\mu A$ and $9\mu A$ respectively. Then the emitter current will be

A. $9.1mA$

B. $18.2mA$

C. $3.91mA$

D. $18.2\mu A$

Answer: A

Watch Video Solution

9. A change of $8mA$ in the emitter current brings a change if $7.9mA$ in the collector current. The change in base current required to have the same change in the collector is

A. $0.01mA$

B. $1A$

C. $10mA$

D. $0.1mA$

Answer: D

Watch Video Solution

10. For a $p-n-p$ transistor in CB configuration, the emitter current I_E is $1mA$ and $\alpha = 0.95$. The base current and collector current are

A. $0.95, A, 0.05mA$

B. $0.05mA, 0.95mA$

C. $9.5, A, 0.5mA$

D. $0.5mA, 9.5mA$

Answer: B

Watch Video Solution

11. If a change of $100\mu A$ in the base current of an $n-p-n$ transistor in CE causes a change of $10mA$ in the collector current, the ac current gain of the transistor is

A. 10

B. 100

C. 1000

D. 10000

Answer: B

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12. For a common emitter amplifier, current gain is 70. If the emitter current is $8.4mA$, then the base current is

A. $0.236mA$

B. $0.118mA$

C. $0.59mA$

D. $8.3mA$

Answer: B

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13. The base current of a transistor is $105\mu A$ and the collector current is $2.05mA$. Then β of the transistor is

A. 1.952

B. 19.52

C. 195.2

D. 1952

Answer: A

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14. For a transistor the value of α is 0.9. β value is

A. 9

B. 0.9

C. 0.09

D. 90

Answer: C

Watch Video Solution

15. For a transistor the current amplification factor is 0.8 The transistor is connected in common emitter configuration, the change in collector current when the base current changes by $6mA$ is

A. $6mA$

B. $4.8mA$

C. $24mA$

D. $8mA$

Answer: C

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16. A change of $400mV$ in base-emitter voltage causes a change of $200\mu A$ in the base current. The input resistance of the transistor is

A. $1K\Omega$

B. $6K\Omega$

C. $2K\Omega$

D. $8K\Omega$

Answer: C

Watch Video Solution

17. In a common base circuit, if the collector base voltage is changed by $0.6V$, collector current changes by $0.02mA$. The output resistance will be

A. $10^4\Omega$

B. $2 \times 10^4\Omega$

C. $3 \times 10^4\Omega$

D. $4 \times 10^4\Omega$

Answer: C

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18. A common emitter transistor amplifier has a current gain of 50. If the load resistance is $4k\Omega$, and input resistance is 500Ω,

the voltage gain of amplifier is.

A. 100

B. 200

C. 300

D. 400

Answer: D

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19. Equivalent of decimal number 8 in the binary number is

A. 10

B. 101

C. 1000

D. 1011

Answer: C

Watch Video Solution

20. The equivalent of 110 in the decimal number is

A. 2

B. 4

C. 8

D. 6

Answer: D

Watch Video Solution

21. If $A = 1, B = 0$ then the value of $\overline{A} + B$ in terms of Boolean algebra is

A. A

B. B

C. B +A

D. $A.\ \overline{B}$

Answer: B

Watch Video Solution

22. In the Boolean algebra : $A + B =$

A. $\overline{A} + \overline{B}$

B. $A.\ B$

C. $\overline{\overline{A}} + \overline{\overline{B}}$

D. $\overline{\overline{A}} + \overline{B}$

Answer: C

Watch Video Solution

23. The following one represents logic addition is

A. $1 + 1 = 2$

B. $1 + 1 = 10$

C. $1 + 1 = 1$

D. $1 + 1 = 11$

Answer: C

Watch Video Solution

24. In the Boolean algebra : $\overline{A}.\overline{B} = \ldots.$

A. $\overline{\overline{A} + B}$

B. $A.B$

C. $\overline{\overline{A} + \overline{B}}$

D. $A + B$

Answer: A

Watch Video Solution

25. In the Boolean algebra, which gate is expressed as $Y = \overline{\overline{A} + B}.$

A. OR

B. $NAND$

C. AND

D. NOR

Answer: D

Watch Video Solution

26. The truth table for NOT gate is.

A. $\begin{bmatrix} 1 & 1 \\ 0 & 0 \end{bmatrix}$

B. $\begin{bmatrix} 1 & 0 \\ 0 & 0 \end{bmatrix}$

C. $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$

D. $\begin{bmatrix} 0 & 1 \\ 1 & 1 \end{bmatrix}$

Answer: C

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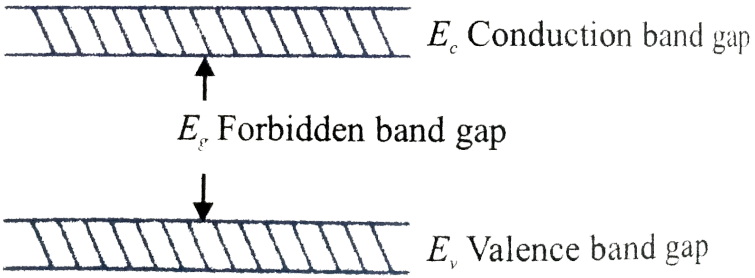
Level Ii H W

1. If the lattice constant of this semiconductor is decreased, then which of the following is correct ?



A. All E_c, E_g&E_v decrease

B. All E_c, E_g&E_v increase

C. E_c and E_v increase, but E_g decrease

D. E_c and E_v decrease but E_g increase

Answer: D

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2. A Ge specimen is dopped with Al. The concentration of acceptor atoms is $\sim 10^{21} atoms/m^3$. Given that the intrinsic concentration of electron hole pairs is $\sim 10^{19}/m^3$, the concentration of electron in the speciman is

A. $10^{17}/m^3$

B. $10^{15}/m^3$

C. $10^4/m^3$

D. $10^2/m^3$

Answer: A

Watch Video Solution

3. The following data are for intrinsic germanium at $300K$. $n_i = 2.4 \times 10^{19}/m^3$, $\mu_e = 0.39m^2/Vs$, $\mu_h = 0.19m^2/Vs$. Calculate the coductivity of intrinsic germanium.

A. $4.3Sm^{-1}$

B. $1.21Sm^{-1}$

C. $2.22Sm^{-1}$

D. $4.22Sm^{-1}$

Answer: C

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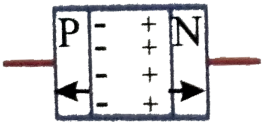
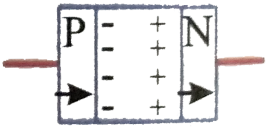
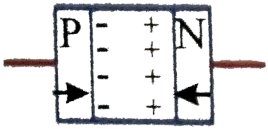
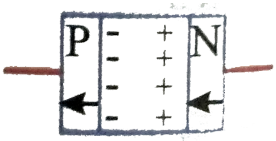
4. The diagram correctly represents the direction of flow of charge carriers in the forward bias of $p-n$ junction is.

A. 

B. 

C. 

D. 

Answer: C

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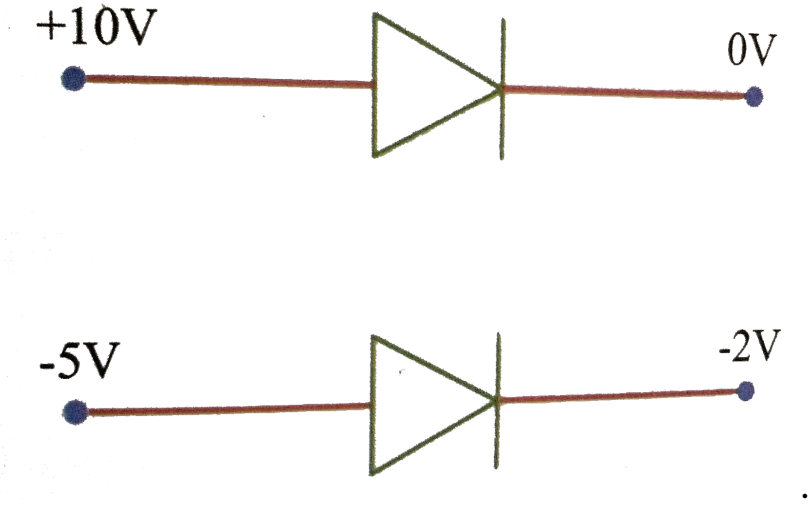
5. In the figure shown below



A. In both Fig a and Fig b the diodes are forward biased

B. In both Fig, a and Fig b the diodes are reverse biased

C. In Fig a the diode is forward biased and in Fig b, the diode is reverse biased

D. In Fig a the diode is reverse biased and in Fig b, it is forward biased

Answer: C

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6. A $P-N$ junction diode can withstand currents up to $10mA$. Under forward bias, The diode has a potential drop of $0.5V$ across it which is assumed to be independent of current. The maximum voltage of the battery used to forward bias the diode when a resistance of 200Ω is connected in series with it is

A. $2.5V$

B. $2.6V$

C. $2.7V$

D. $2.8V$

Answer: A

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7. A cell of emf. $4.5V$ is connected to a junction diode whose barrier potential is $0.7V$. If the external resistance in the circuit is 190Ω. The current in the circuit is

A. $20mA$

B. $2mA$

C. $23mA$

D. $200mA$

Answer: A

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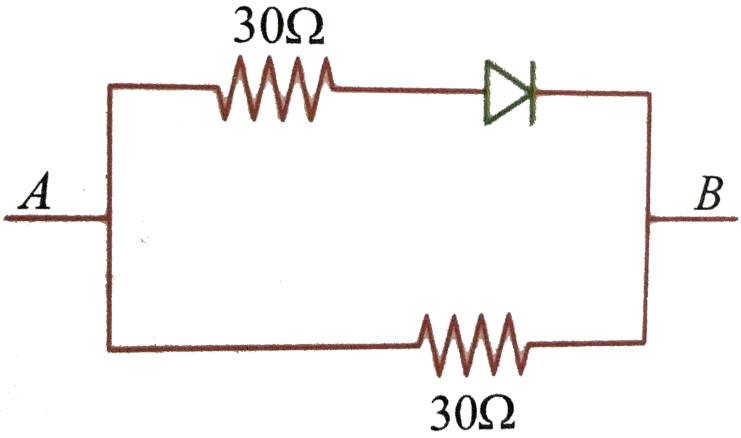
8. V_A and V_B denote potential of A and B, then the equivalent resistance between A and B in the adjoining circuit is (ideal diode).



A. 15Ω if $V_A > V_B$

B. 30Ω if $V_A < V_B$

C. both 1 and 2

D. neither 1 nor 2

Answer: C

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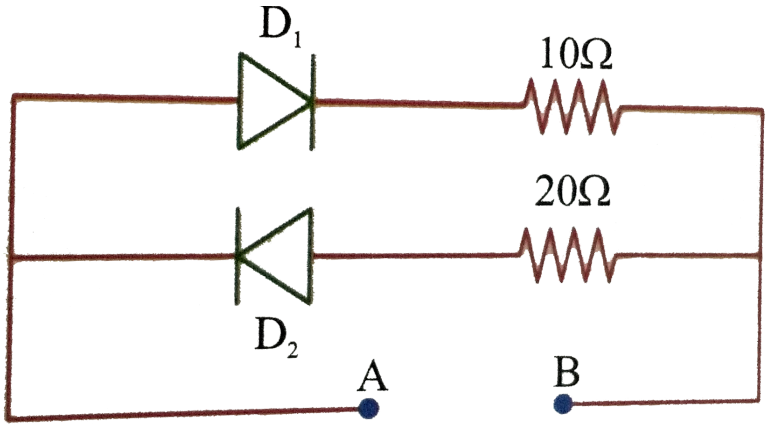
9. Two ideal junction diodes D_1, D_2 are connected as shown in the figure. A $3V$ battery is connected between A and B. The current supplied by the battery if its positive terminal is connected to A is



A. $0.1A$

B. $0.3A$

C. $0.9A$

D. $90A$

Answer: B

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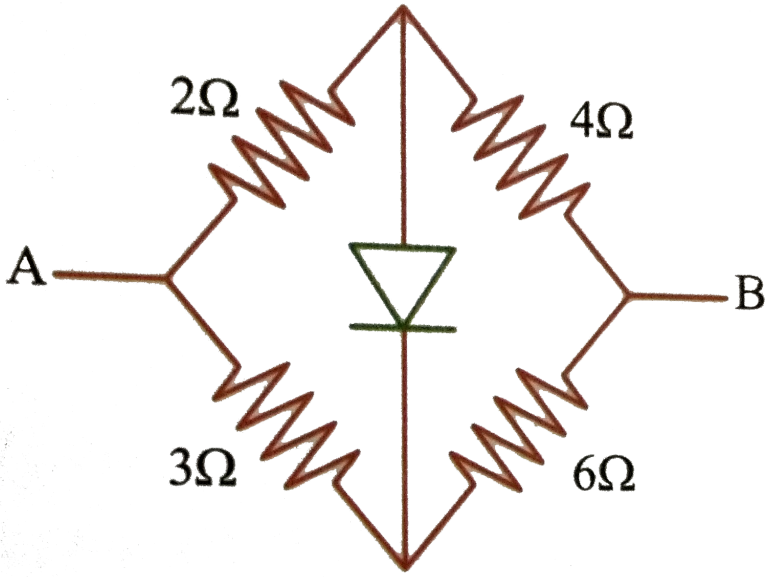
10. Find the effective resistance between A and B



A. $5/18_{\Omega}$

B. $9/5_{\Omega}$

C. $18/5_{\Omega}$

D. $5/9_{\Omega}$

Answer: C

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11. The peak voltage in the output of a half-wave diode rectifier fed with a sinusiodal signal without filter is $10V$. The dc component of the output voltage is

A. $10/\sqrt{2}V$

B. $10/\pi V$

C. $10V$

D. $20/\pi V$

Answer: B

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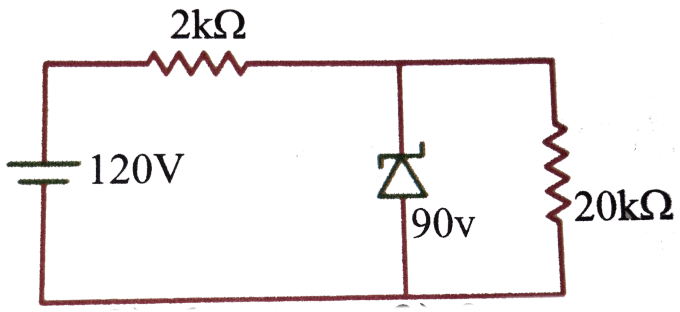
12. In the figure shown the potential drop across the series resistor is



A. 30 V

B. 60 V

C. 90 V

D. 120 V

Answer: A

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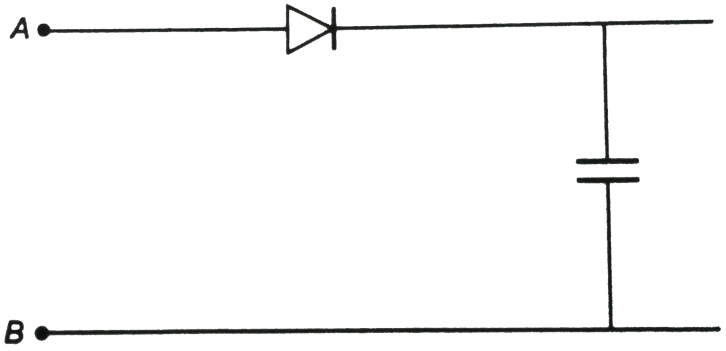
13. A 220 V AC supply is connected between points A and B .

What will be the potential difference V across the capacitor ?



A. 200 V

B. 110 V

C. 0 V

D. $220\sqrt{2}V$

Answer: D

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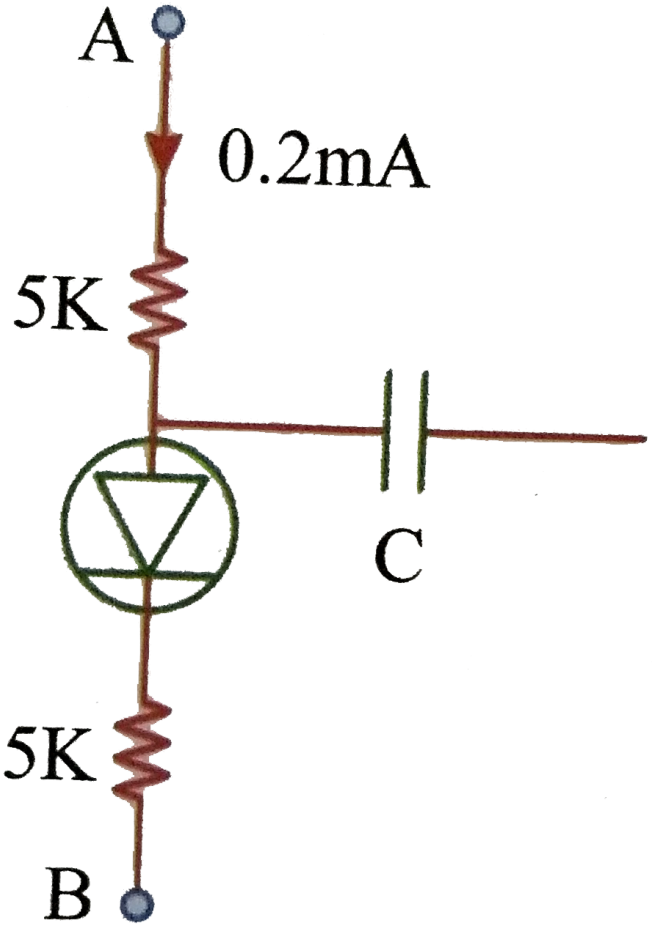
14. In the circuit shown(Fig.) if the diode forward voltage drop is $0.3V$, the voltage difference between A and B is :



A. $1.3V$

B. $2.3V$

C. 0

D. $0.5V$

Answer: B

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15. In an n-p-n transistor 10^{10} electrons enter the emitter in 10^{-6}s. If 2% of the electrons are lost in the base, find the current transfer ratio and the current amplification factor.

A. $0.98, 49$

B. $0.49, 49$

C. $0.98, 98$

D. $0.49, 98$

Answer: A

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16. In a common base mode of transistor, collector current is $5.488mA$ for an emitter current of $5.60mA$. The value of the base current amplification factor (β) will be :

A. 48

B. 49

C. 50

D. 51

Answer: B

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17. Current amplification factor of a common base configuration is 0.88. Find the value of base current when the

emitter current is $1mA$.

A. $0.12mA$

B. $0.1mA$

C. $0.5mA$

D. $0.2mA$

Answer: A

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18. For a transistor $\beta = 40$ and $I_B = 25\mu A$. Find the value of I_E.

A. 1mA

B. $1.025mA$

C. 2 mA

D. $1.2mA$

Answer: B

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19. In a transistor if $\frac{I_C}{I_E} = \alpha$ and $\frac{I_C}{I_B} = \beta$,If α varies between $\frac{20}{21}$ and $\frac{100}{101}$, then the value of β lied between.

A. $1 - 10$

B. $0.95 - 0.99$

C. $20 - 100$

D. $200 - 300$

Answer: C

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20. For a transistor $x = \frac{1}{\alpha} \& y = \frac{1}{\beta}$ where $\alpha \& \beta$ are current gains in common base and common emitter configuration. Then

A. $x + y = 1$

B. $x - y = 1$

C. $2x = 1 - y$

D. $x + y = 0$

Answer: B

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21. A voltage amplifier operated from a 12 volt battery has a collector load $6k\Omega$. Calculate the maximum collector current in the circuit.

A. $0.5mA$

B. $1mA$

C. $3mA$

D. $2mA$

Answer: D

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22. A CE amplifier is designed with a transistor having $\alpha = 0.99$. Input impedance is $1k\Omega$ and load is $10k\Omega$. Voltage

gain will be :

A. 9900

B. 99000

C. 99

D. 990

Answer: D

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23. In a common emitter amplifier the load resistance of the output circuit is 792 times the resistance of the input circuit. If $\alpha = 0.99$. The voltage gain is.

A. 79200

B. 39600

C. 7920

D. 3960

Answer: A

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24. In a transistor amplifier $\beta = 62$, $R_L = 5000\Omega$ and internal resistance of the transistor is 500Ω. Its power amplification will be.

A. 25580

B. 33760

C. 38440

D. 55760

Answer: C

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25. The tuned collector oscillator circuit used in the local oscillator of a ratio receiver makes use of a tuned circuit with $L = 60\mu H$ and $C = 400pE$. Calculate the frequency of oscillations.

A. $1.03KHz$

B. $1.03Hz$

C. $1.03GHz$

D. $1.03MHz$

Answer: D

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26. When we add binary number 111 and 111 we get the binary number :

A. 222

B. 1000

C. 1110

D. 000

Answer: C

Watch Video Solution

27. If $A = B = C = 1$ and $X = \overline{ABC} + B\overline{BC} + C\overline{AB}$, then $X =$

A. 0

B. 1

C. 100

D. 110

Answer: A

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28. The input of A and $B$for the Boolean expression $\left(\overline{A + B}\right).\left(\overline{A.B}\right) = 1$ is.

A. $0, 0$

B. $0, 1$

C. $1, 0$

D. $1, 1$

Answer: A

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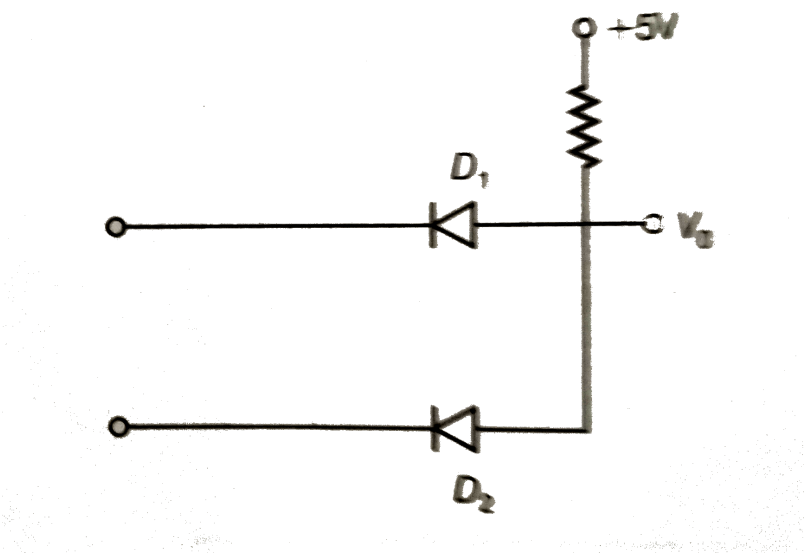
29. Write the truth table for the circuit shown in figure given below. Name the gate that the circuit resembles.



A. AND gate

B. OR gate

C. NOR gate

D. XOR gate

Answer: A

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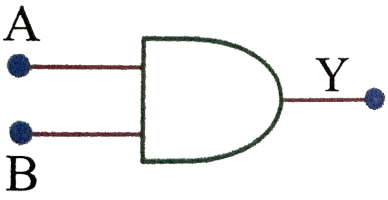
30. Consider a two-input AND gate of figure below. Out of the four entries for the Truth Table given here, the correct ones are.



	Input		Output
	A	B	Y
1	0	1	0
2	1	0	0
3	1	1	1
4	0	0	1

A. All

B. 1 and 2 only

C. 1, 2 and 3 only

D. 1, 3 and 4 only

Answer: C

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31. A Truth table is given below. The below. The logic gate having following truth table is.

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

.

A. $NAND$ gate

B. NOR gate

C. AND gate

D. OR gate

Answer: B

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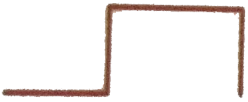
32. For a logic 0101 the waveform is.

A. 

B. 

C. 

D. 

Answer: A

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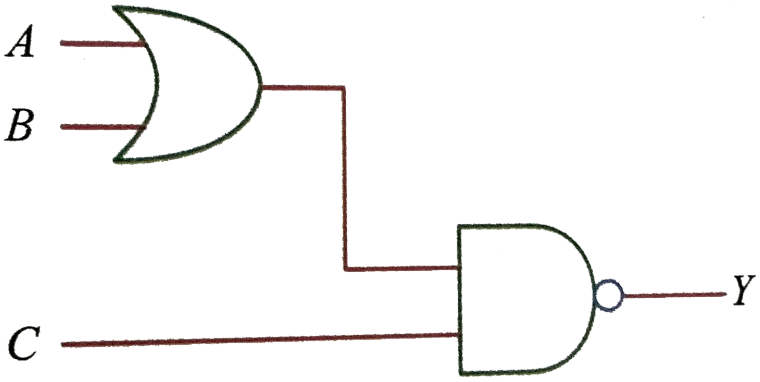
33. For the given combination of gates, if the logic states of inputs A, B, C are as follows $A = B = C = -0$ and

$A = B = 1, C = 0$ then the logic states of output D are



A. $0, 0$

B. $0, 1$

C. $1, 0$

D. $1, 1$

Answer: D

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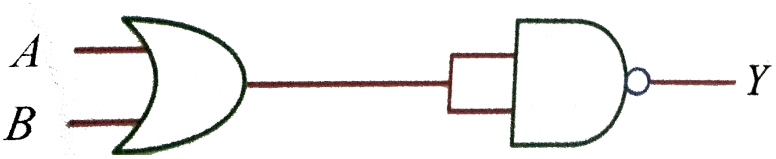
34. Identify the gate represented by the block diagram as shown in fig.



A. AND gate

B. NOT gate

C. $NAND$ gate

D. NOR gate

Answer: D

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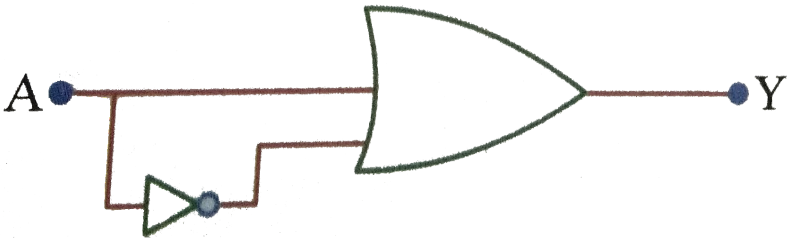
35. The Boolean expression for the gate circuit shown below is



A. $A + \overline{A} = 1$

B. $A + 1 = 1$

C. $A + A = A$

D. $A + 0 = A$

Answer: A

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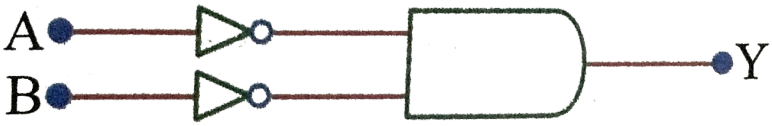
36. The output Y of the gate circuit shown in the figure below is



A. $\overline{A.B}$

B. $\overline{A}.\overline{B}$

C. $\overline{\overline{A.B}}$

D. $\overline{A}+\overline{B}$

Answer: B

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