Ravi Maths Tuition Centre

Time : 1 Mins **SEMICONDUCTOR ELECTRONIC DEVICES 1** **Marks : 660**

Instruction

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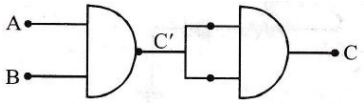
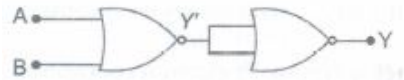
1. A piece of copper and other of germanium are cooled from room temperature to 80 K, then:
   a) resistance of each will increase b) resistance of copper will decrease
   c) resistance of copper will increase while that of germanium will decrease
   d) resistance of copper will decrease while that of germanium will increase
2. The output from a NAND gate is divided into two in parallel and fed to another NAND gate. The resulting gate is a _____ .



   a) NOR gate b) OR gate c) NOT gate d) AND gate
3. In the following circuit, the output Y for all possible inputs A and B is expressed by the truth table:



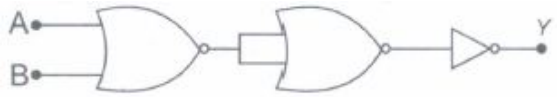
a)	b)	c)	d)
ABY	ABY	ABY	ABY
011	001	011	001
011	010	101	010
101	100	000	100
110	110	111	111

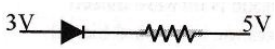
4. The radius of germanium (Ge) nuclide is measured to be twice the radius of $^{9}_{4}\mathrm{Be}$. The number of nucleons in Ge are:
   a) 74 b) 75 c) 72 d) 73
5. To obtain a p-type germanium semiconductor, it must be doped with
   a) Phosphorus b) Indium c) Antimony d) Arsenic
6. The following truth table belongs to which of the following four gates?

Input	**Output**
A B	Y
1 1	0
1 0	0
0 1	0
0 0	1

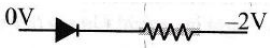
   a) NOR b) XOR c) NAND d) OR

7. For transistor action, which of the following statements is correct?
   a) The base region must be very thin and lightly doped.
   b) Base, emitter and collector regions should have same doping concentrations.
   c) Base, emitter and collector regions should have same size.
   d) Both emitter junction as well as the collector junction are forward biased.
8. The given electrical network is equivalent to:



   a) AND gate b) OR gate c) NOR gate d) NOT gate
9. A transistor has a current amplification factor (current gain) of 50. In a common emitter amplifier circuit, the collector resistance is chosen as 5 Ω and the input resistance is 1Ω. The output voltage if input voltage is 0.01 V is
   a) -2 V b) -5 V c) -2.5 V d) -1 V
10. The input resistance of a silicon transistor is 100 Ω. Base current is changed by 40 μA which results in a change in collector current by 2 mA. This transistor is used as a common emitter amplifier with a load resistance of 4 kΩ. The voltage gain of the amplifier is :
    a) 3000 b) 4000 c) 1000 d) 2000
11. A forward biased diode is:
    a) 

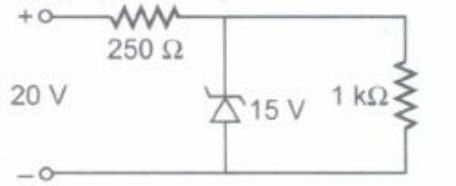
    b) 

    c) 

    d) 

12. An amplifier has a voltage gain of 100. The voltage gain in dB is
    a) 20 dB b) 40 dB c) 30 dB d) 50 dB
13. In a junction diode, the holes are due to:
    a) Protons b) Extra electrons c) Neutrons d) Missing electrons
14. The manifestation of band structure in solids is due to
    a) Heisenberg uncertainty principle b) Pauli's exclusion principle
    c) Bohr's correspondence principle d) Boltzmann law
15. A P-N junction photodiode is made of a material with a band gap of 2.0 eV. The minimum frequency of radiation that can be absorbed by the material is nearly:
    a) 10×10^{14} Hz b) 5×10^{14} Hz c) 1×10^{14} Hz d) 20×10^{14} Hz
16. In pure semiconductor, the number of conduction electrons is 6×10^{18} per cubic metre. How many holes are there in a sample of size 1 cm x 1 cm x 1 mm?
    a) 3×10^{10} b) 6×10^{11} c) 3×10^{11} d) 6×10^{10}
17. Which one of the following bonds produces a solid that reflects light in the visible region and whose electrical conductivity decreases with temperature and has high melting point?
    a) metallic bonding b) van der Wall's bonding c) ionic bonding d) covalent bonding
18. An oscillator is nothing but an amplifier with:
    a) positive feedback b) negative feedback c) large gain d) no feedback
19. The output of OR gate is 1 :
    a) if either input is zero b) if both inputs are zero c) if either or both input are 1
    d) only if both inputs are 1

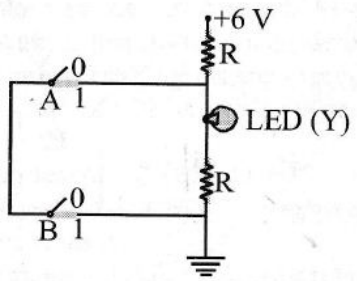
20. In which of the following devices, the Eddy current effect is not used?
    a) Magnetic braking in train b) Electromagnet c) Electric heater d) Induction furnace
21. The number density of electrons and holes in pure silicon at 27°C are equal and its value is $2.0 \times 10^{16} m^{-3}$. On doping with indium the hole density increases to $4.5 \times 10^{22} m^{-3}$, the electron density in doped silicon is:
    a) $10 \times 10^{9} m^{-3}$ b) $8.89 \times 10^{9} m^{-3}$ c) $11 \times 10^{9} m^{-3}$ d) $16.78 \times 10^{9} m^{-3}$
22. The part of the transistor which is heavily doped to produce large number of majority carriers is:
    a) emitter b) base c) collector
    d) any of the above depending upon the nature of transistor
23. The transfer characteristics of a base biased transistor has the operation regions, namely, cutoff, active region and saturation region. For using the transistor as an amplifier it has to operate in the
    a) active region b) cutoff region c) saturation region d) cutoff and saturation
24. For transistor action:
    (1) Base, emitter and collector regions should have similar size and doping concentrations.
    (2) The base region must be very thin and lightly doped.
    (3) The emitter-base junction is forward biased and base-collector junction is reverse based.
    (4) Both the emitter-base junction as well as the base-collector junction are forward biased.
    a) (3)(4) b) (4)(1) c) (1)(2) d) (2)(3)
25. If a small amount of antimony is added to germanium crystal:
    a) it becomes a p-type semiconductor b) the antimony become an acceptor atom
    c) there will be more free electrons than holes in the semiconductor
    d) its resistance is increased
26. In a p-n junction photocell, the value of the photoelectromotive force produced by monochromatic light is proportional to:
    a) The voltage applied at the p-n junction b) The barrier voltage at the p-n junction
    c) The intensity of the light falling on the cell d) The frequency of the light falling on the cell
27. A zener diode, having breakdown voltage equal to 15V, is used in a voltage regulator circuit shown in figure. The current through the diode is :



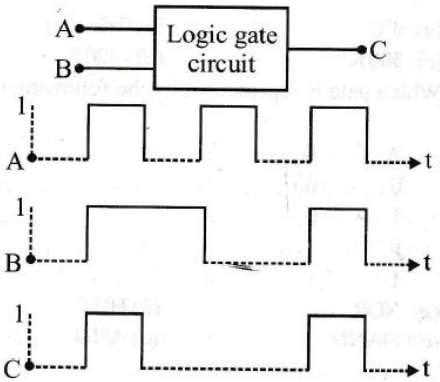
    a) 10 mA b) 15 mA c) 20 mA d) 5 mA
28. The barrier potential of a P-N junction depends on:
    (1) type of semi conductor material
    (2) amount of doping
    (3) temperature
    Which one of the following is correct?
    a) (2) only b) (2) and (3) only c) (1), (2) and (3) d) (1) and (2) only
29. In an n-p-n transistor 10^{10} electron enter the emitter in 10^{-6} s. If 2% of the electrons are lost in the base, the current amplification factor is

a) 0.02 b) 7 c) 33 d) 4.9

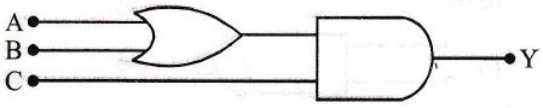
30. In forward bias the width of depletion layer in a p-n junction diode:
    a) Increases b) Decreases c) Remains constant d) First increases then decreases
31. The correct Boolean operation represented by the circuit diagram drawn is:



    a) OR b) NAND c) NOR d) AND
32. Which of the following is added as an impurity, into the silicon, produces n-type semiconductor?
    a) Phosphorous b) Aluminium c) Magnesium d) Both b and c
33. The following figure shows a logic gate circuit with two inputs A and B and the output C. The voltage waveforms of A, B and C are as shown below

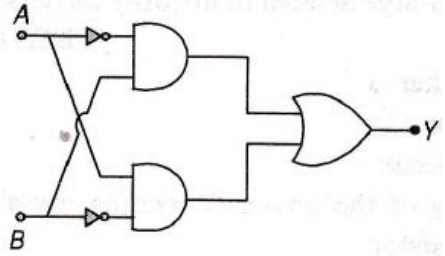


    The logic circuit gate is:
    a) NAND gate b) NOR gate c) OR gate d) AND gate
34. Zener diode is used for:
    a) amplification b) rectification c) stabilisation d) producing oscillations in an oscillator
35. To get an output Y = 1 from the circuit shown below, the input must be



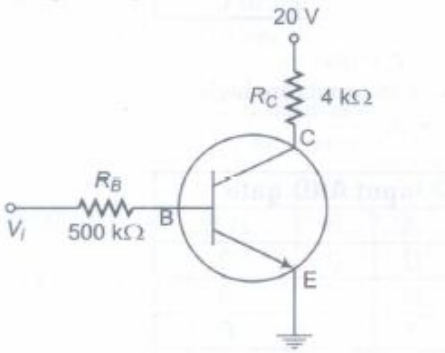
a)	b)	c)	d)
ABC	ABC	ABC	ABC
011	001	101	100

36. The following circuit represents.



    a) OR gate b) XOR gate c) AND gate d) NAND gate

37. In the circuit shown in the figure, the input voltage Vi is 20V, V_{BE} = 0 and V_{CE} = O. The values of I_B, I_C and p are given by:

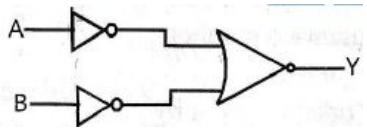


a) I_B=20 μA, I_C=5 mA, β=250 b) I_B=25 μA, I_C=5 mA, β=200
c) I_B=40 μA, I_C=10 mA, β=250 d) I_B=40 μA, I_C=5 mA, β=125

38. p-n junction is said to be forward biased, when
a) the positive pole of the battery rs connected to n-semiconductor and p-semiconductor
b) mechanical force is applied in the forward directon
c)
the positive pole of the battery is joined to the p-semiconductor and negative pole to the n-semiconductor
d) the positive pole of the battery is joined to the n-semiconductor and p-semiconductor

39. The input resistance of a common emitter transistor amplifier, if the output resistance is 500 k Ω , the current gain a = 0.98 and the power gain is 6.0625 x 10^6 , is
a) 198Ω b) 300Ω c) 100Ω d) 400Ω

40. For the logic circuit shown, the truth table is:



a)	b)	c)	d)
ABY	ABY	ABY	ABY
001	000	000	001
010	010	011	011
100	100	101	101
110	111	111	110

41. What happensduring regulationactionofa Zenerdiode?
a) The current through the series resistance (R_s) changes.
b) The resistance offered by the Zener changes. c) The Zener resistance is constant.
d) Both (a) and (b)

42. C and Si both have same lattice structure, having 4 bonding electrons in each. However, C is insulator whereas Si is intrinsic semiconductor. This is because:
a) In case of C the valence band is not completely filled at absolute zero temperature.
b) In case of C the conduction band is partly filled even at absolute zero temperature.

c)

The four bonding electrons in the case of C lie in the second orbit, whereas in the case of Si they lie in the third.

d)

The four bonding electrons in the case of C lie in the third orbit, whereas for Si they lie in the fourth orbit.

43. In p-n-p transistor circuit, the collector current is 10mA. If 90%of the holes reach the collector, the emitter and base currents respectively are

a) 10 mA, 1mA b) 22 mA, 11mA c) 11mA, 1mA d) 20 mA, 10mA

44. In a p-n junction diode, change in temperature due to heating:

a) Does not affect resistance of p-n junction b) Affects only forward resistance

c) Affects only reverse resistance d) Affects the overall V-I characteristics of P-N junction

45. Application of a forward bias to a p-n junction:

a) Widens the depletion zone

b) Increases the potential difference across the depletion zone

c) Increases the number of donors on the n side

d) Increases the electric field in the depletion zone

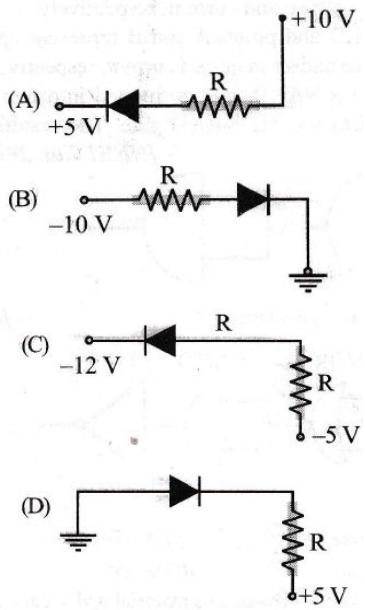
46. A block of pure silicon at 300 K has a length of 10 cm and an area of 1.0 cm^2. A battery of emf 2 V is connected across it. The mobility of electrons is 0.14 $m^2 V^{-1} S^{-1}$and their number density is 1.5 x $10^{16} m^{-3}$ • The electron current is

a) 6.72 x 10^{-4}A b) 6.72 x 10^{-5} A c) 6.72 X 10^{-6}A d) 6.72 x 10^{-7} A

47. Find the wavelength of light that may excite an electron in the valence band of diamond to the conduction band. The energy gap is 5.50 eV.

a) 226 nm b) 312 nm c) 432 nm d) 550 nm

48. In the following figure, the diodes which are forward biased, are:

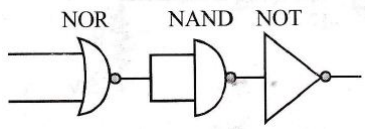


a) (C) only b) (C) and (A) c) (B) and (D) d) A), (B) and (D)

49. A transistor is operated in common emitter configuration at constant collector voltage V_c = 1.5V such that a change in the base current from 100 mA to 150 mA produces a change in the collector current from 5 mA to 10 mA. The current gain (b) is:

a) 75 b) 100 c) 50 d) 67

50. A Zener diode is specified as having a breakdown voltage of 9.1 V, with a maximum power dissipation of 364 mW What is the maximum current the diode can handle?
    a) 40 mA b) 60 mA c) 50 mA d) 45 mA
51. For amplification by a triode, the signal to be amplified is given to:
    a) the cathode b) the grid c) the glass-envelope d) the anode
52. The circuit is equivalent to



    a) AND gate b) NAND gate c) NOR gate d) OR gate
53. Diamond is very hard, because
    a) it is covalent solid b) it has large cohesive energy c) high melting point
    d) insoluble in all solvents
54. Two amplifier are connected one after the other in series (cascade). The first amplifier has a voltage gain 10 and the second has a voltage gain of 20. If the input signal is 0.01 V, the output ac signal will be
    a) 4V b) 1V c) 2V d) 6V
55. When Arsenic is added as an impurity to silicon the resulting material is:
    a) n-type semiconductor b) p-type semiconductor c) n-type conductor d) insulator
56. In P-N junction photocell, the value of the photoelectromotive force produced by monochromatic light is proportional to:
    a) voltage applied at the P-N junction b) the barrier voltage at the P-N junction
    c) intensity of the light falling on the cell d) frequency of the light falling on the cell
57. The current amplification factor $\alpha$of a common base transistor and the current amplification factor β of a common emitter transistor are not related by
    a) $\alpha = \frac{\beta}{1+\beta}$ b) $\beta = \frac{\alpha}{1-\alpha}$ c) $\frac{1}{\alpha} - \frac{1}{\beta} = 1$ d) $\beta = \frac{\alpha}{1+\alpha}$
58. In a full wave junction diode rectifier the input ac has rms value of 20 V. The transformer used is a step up transformer having primary and secondary turn ratio 1 : 2. The de voltage in the rectified output is
    a) 12V b) 24V c) 36V d) 42V
59. A pure Si crystal has 5 x 10^{22}atoms m^{-3}.It is doped by 1 ppm concentration of pentavalent As. The number of holes is ($n_i^2 = n_p n_e$) (Take n_i = 1.5 x $10^{16}m^{-3}$
    a) 4.5 x 10^9m^{-3} b) 4.5 x 10^6m^{-3} c) 2.5 x 10^9m^{-3} d) 2.5 x 10^6m^{-3}
60. Region without free electrons and holes in a p-n junction is
    a) n-region b) p-region c) depletion region d) none of these
61. For a p-type semiconductor, which of the following statements is true?
    a) Holes are the majority carriers and trivalent atoms are the dopants.
    b) Holes are the majority carriers and pentavalent atoms are the dopants.
    c) Electrons are the majority carriers and.pentavalent atoms are the dopants.
    d) Electrons are the majority carriers and trivalent atoms are the dopants.

62. A transistor is operated in common emitter configuration at V_C = 2 V such that a change in the base current from 100 μA - 300 μA produces a change in the collector current from 10 mA to 20 mA. The current gain is :
    a) 50 b) 75 c) 100 d) 25

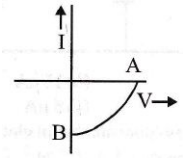
63. For a cubic crystal structure which one of the following relations indicating the cell characteristics is correct?
    a) $a \neq b \neq c$ and a = b = g = 90° b) $a = b = c$ and a ≠ b ≠ g = 90°
    c) $a = b = c$ and a = b = g = 90° d) $a \neq b \neq c$ and a ≠ b and g ≠ 90°

64. When n-type semiconductor is heated:
    a) number of electrons increases while that of holes decreases
    b) number of holes increases while that of electrons decreases
    c) number of electrons and holes remain same
    d) number of electrons and holes increases equally

65. In p-type semiconductor, the majority charge carriers are:
    a) Holes b) Electrons c) Protons d) Neutrons

66. In p-n junction:
    a) The potential of the p and n side becomes higher alternately
    b) The p-side is at higher electrical potential than the n-side
    c) The n-side is at higher electrical potential than the p-side
    d) Both the p and n sides are at the same potential

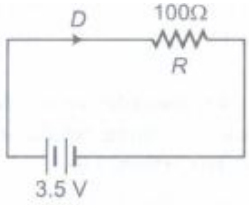
67. The given graph represents V-I characteristic for a semiconductor device.



    Which of the following statement is correct?
    a)
    It is V-I characteristic for solar cell where, point A represents open circuit voltage and point B short circuit current.
    b)
    It is for a solar cell and point A and B represent open circuit voltage and current, respectively.
    c)
    It is for a photodiode and points A and B represent open circuit voltage and current, respectively.
    d)
    It is for a LED and points A and B represent open circuit voltage and short circuit current, respectively.

68. Three photo diodes D_1, D_2 and D_3 are made of semiconductors having band gap of 2.5 eV, 2 eV and 3 eV, respectively. Which one will be able to detect light of wavelength 6000Å?
    a) D_1 b) D_2 c) D_3 d) D_1 and D_2both

69. In the given figure, a diode D is connected to an external resistance R =100 Ω and an e.m.f of 3.5V. If the barrier potential developed across the diode is 0.5 V, the current in the circuit will be:

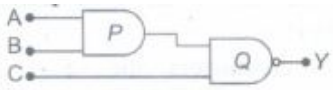


a) 35 mA b) 30 mA c) 40 mA d) 20 mA

70. For a common emitters transistor amplifier, the audio signal voltage across the collector resistance of 2 kΩ is 2 V. Suppose the current amplification factor of the transistor is 100, the base current if base resistance is 1kΩ is

a) $10\mu A$ b) $20\mu A$ c) $5\mu A$ d) $2\mu A$

71. What is the output Y in the following circuit, when all the three inputs A,B,C are first 0 and then 1?

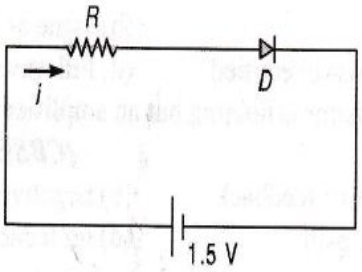


a) 0,1 b) 0,0 c) 1,0 d) 1,1

72. What will be input of A and B for the Boolean expression $(A + B \cdot (A.B) = 1$?

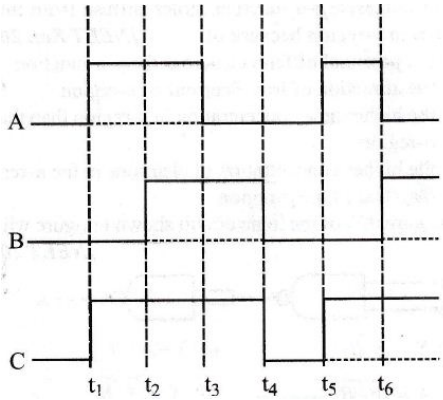
a) (0, 0) b) (0, 1) c) (1, 0) d) (1, 1)

73. The diode used in the circuit shown in the figure has a constant voltage drop of 0.5 V at all currents and a maximum power rating of 100 milliwatt. What should be the value of the resistor R, connected in series with the diode, for obtaining maximum current i?



a) 200 W b) 6.67 W c) 5 W d) 15 W

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



a) OR gate b) NOR gate c) AND gate d) NAND gate

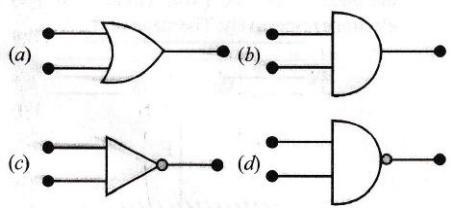
75. Three amplifiers X, Y and Z are connected in series. If the voltage gains of X, Y and Z are 10, 20 and 30 respectively and the input signal is 1mV peak value, then what is the output signal voltage (peak value) if dc supply voltage is 10V?

a) 4V b) 5V c) 6V d) 7V

76. To use a transistor as an amplifier:
    a)
    the emitter base junction is forward biased and the base collector junction is reversed biased
    b) no bias voltage is required c) both junctions are forward biased
    d) both junctions are reverse biased

77. A transistor is operated in common-emitter configuration at V_c = 2V such that a change in the base current from 100 mA to 200 mA produces a change in the collector current from 5 mA to 10 mA. The current gain is _____ .
    a) 100 b) 150 c) 50 d) 75

78. Symbolic representation of four logic gate are shown as



    Pick out which ones are for AND, NAND and NOT gates, respectively:
    a) (ii), (iii) and (iv) b) (iii), (ii) and (i) c) (iii), (iii) and (iv) d) (ii), (iv) and (iii)

79. The following truth table corresponds to the logical gate:

Input		**Output**
A	**B**	**Y**
0	0	0
0	1	1
1	0	1
1	1	1

    a) NAND b) OR c) AND d) XOR

80. The input resistance of a transistor is 1000 Ω on charging its base current by 10 μA the collector current increases by 2 mA. If a load resistance of 5 kΩ is used in the circuit, the voltage gain of the amplifier is
    a) 100 b) 500 c) 1000 d) 1500

81. Barrier potential of a p-n junction diode does not depend on:
    a) Doping density b) Diode design c) Temperature d) Forward bias

82. The intrinsic semiconductor becomes an insulator at:
    a) 0^oC b) 0 K c) 300 K d) -100^oC

83. A P-N photodiode is fabricated from a semiconductor with a band gap of 2.5 eV. It can detect a signal of wavelength
    a) 4000 nm b) 6000 nm c) 4000 Å d) 6000 Å

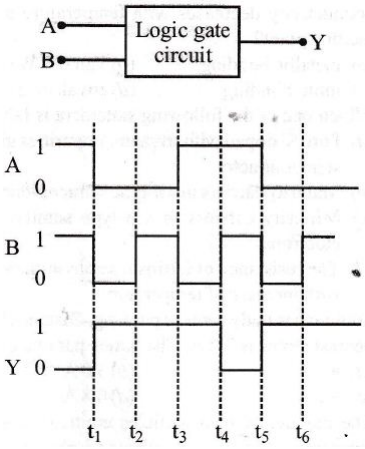
84. When a n-p-n transistor is used as an amplifier, then
    a) The electrons flow from emitter to collector b) The holes flow from emitter to collector
    c) The electrons flow from collector to emitter d) The electrons flow from battery to emitter

85. An N-P-N transistor conducts when:
    a) both collector and emitter :are negative with respect to the base.
    b) both collector and emitter are positive with respect to the base

c) collector is positive and emitter is negative with respect to the base

d) collector is positive and emitter is at same potential as the base

86. The following figure shows a logic gate circuit with two inputs A and B and the output Y. The voltage waveforms of A, B and Y are given:



The logic gate is:

a) NAND gate b) NOR gate c) OR gate d) AND gate

87. An intrinsic semiconductor has a resistivity of 0.50 Ω m at room temperature. Find the intrinsic carrier concentration if the mobilities of electrons and holes are 0.39 $m^2 V^{-1} S^{-1}$ and 0.11 $m^2 V^{-1} S^{-1}$ respectively:

a) 1.2×10^{18} m^{-3} b) 2.5×10^{19} m^{-3} c) 1.9×10^{20} m^{-3} d) 3.1×10^{21} m^{-3}

88. In a p-n junction:

a) The potential of the p and n -sides becomes higher alternately

b) The p-side is at higher electrical potential than the n side

c) The n-side is at higher electrical potential than the p-side

d) Both the p and n-sides are at the same potential

89. If a change of 100μA in the base current of an n-p-n transistor causes a change of 10 mA in its collector current, its ac current gain is

a) 50 b) 100 c) 200 d) 150

90. In a CE transistor amplifier, the audio signal voltage across the collector resistance of 2kW is 2V. If the base resistance is 1kW and the current amplification of the transistor is 100, the input signal voltage is:

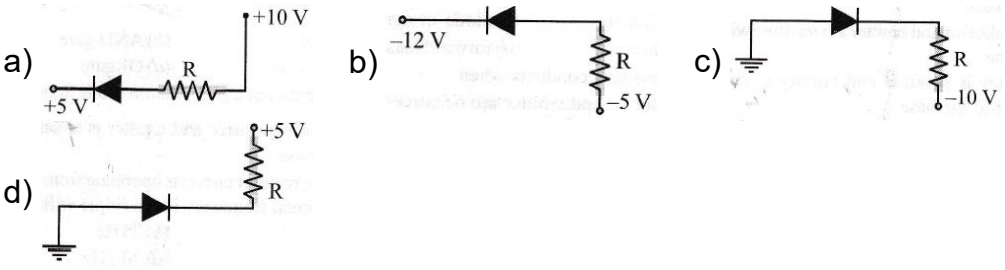
a) 0.1 V b) 1.0 V c) 1 mV d) 10 mV

91. The emitter of transistor is doped the heaviest because it

a) acts as a supplier of charge carriers b) dissipates maximum power

c) has a larger resistance d) has a small resistance

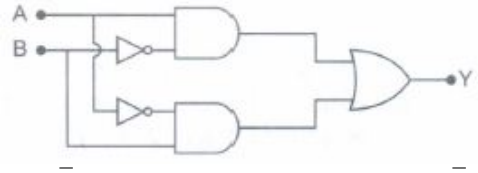
92. Of the diodes shown in following diagrams, which one is reverse biased?



93. Choose the only false statement from the following:

a) In conductors, the valence and conduction bands may overlap
b) Substances with energy gap of the order of 10 eV are insulators
c) The resistivity of semiconductor increases with increase in temperature.
d) The conductivity of semiconductor increases with increase in temperature

94. In the combination of the following gates the output Y can be written in terms of inputs A and B as:



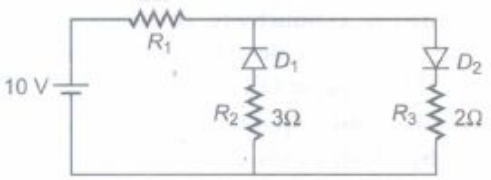
a) $A.B$+A.B b) A.$\bar{B}$+$\bar{A}$.B c) $A.B$ d) $A+B$

95. In forward biasing of the p-n junction
a)
the positive terminal of the battery is connected to p-side and the depletion region becomes thick
b)
the positive terminal of the battery is connected to n-side and the depletion region becomes thin
c)
the positive terminal of the battery is connected to n-side and the depletion region becomes thick
d)
the positive terminal of the battery is connected to p-side and the depletion region becomes thin

96. The ac current gain of a transistor is 120. What is the change in the collector current in the transistor whose base current changes by 100μA?
a) 6mA b) 12mA c) 3mA d) 24mA

97. The probability of electrons to be found in the conduction band of an intrinsic semiconductor of finite temperature
a) increases exponentially with increasing band gap.
b) decreases exponentially with increasing band gap.
c) decreases with increasing temperature.
d) is independent of the temperature and band gap.

98. The given circuit has two ideal diodes connected as shown in the figure below. The current flowing through the resistance R_1 will be:



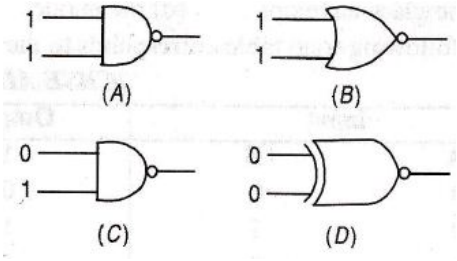
a) 1.43 A b) 3.13 A c) 2.5 A d) 10.0 A

99. In an n-p-n circuit transistor, the collector current is 10mA. If 80% electron emitted to reach the collector, then

a) the emitter current will be 7.5 mA b) the emitter current will be 12.5 mA
c) the base current will be 3.5 mA d) the base current will be 1.5 mA

100. In the case of a common emitter transistor amplifier, the ratio of the collector current to the emitter current I_c/I_e 0.96. The current gain of the amplifier is _____ .
a) 6 b) 48 c) 24 d) 12

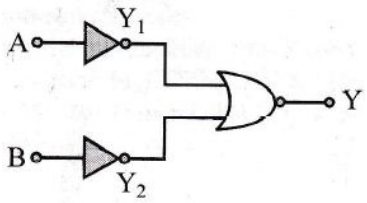
101. Which one of the following gates will have an output of 1?



a) A b) B c) C d) D

102. The peak voltage in the output of a half-wave diode rectifier fed with a sinusoidal signal without filter is 10V. The d.c. component of the output voltage is _____.
a) 20/pV b) $10/\sqrt{2}$V c) 10/pV d) 10V

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



a) NAND b) AND c) NOR d) OR

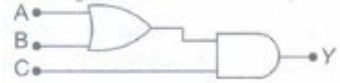
104. For a common emitter circuit if I_C/I_E = 0.98 then current gain for common emitter circuit will be.
a) 49 b) 98 c) 4.9 d) 25.5

105. When a p-n junction diode is reverse biased the flow of current across the junction is mainly due to:
a) diffusion of charges b) drift charges c) depends on the nature of material
d) both drift and diffusion of charges

106. Which of the following statements is incorrect for the depletion region of a diode?
a) There the mobile charges exist.
b) Equal number of holes and electrons exist,making the region neutral.
c) Recombination of holes and electrons has taken place. d) None of these

107. In a common emitter transistor amplifier the audio signal voltage across the collector is 3 V. The resistance of collector is 3 kΩ If current gain is 100 and the base resistance is 2 kΩ, the voltage and power gain of the amplifier is:
a) 200 and 1000 b) 15 and 200 c) 150 and 15000 d) 20 and 2000

108. Toget output 1 for the following circuit, the correct choice for the input is:

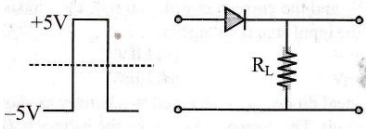


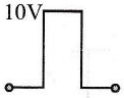
a) A = 0, B = 1, C = 0 b) A = 1, B = 0, C = 0 c) A = 1, B = 1, C = 0 d) A = 1, B = 0, C = 1

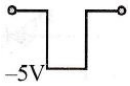
109. In n-type semiconductor when all donor states are filled, then the net charge density in the donor states becomes

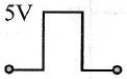
a) 1 b) >1 c) <1, but not zero d) zero

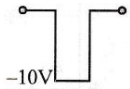
110. If in a p-n junction, a square input signal of 10V is applied as shown, then the output across R_L will be:



a) 

b) 

c) 

d) 

111. A transistor has a current gain of 30. If the collector resistance is 6 kΩ input resistance is 1 kΩ , its voltage gain is:
a) 90 b) 180 c) 45 d) 360

112. In a half wave rectifier circuit operating from 50 Hz mains frequency, the fundamental frequency in the ripple would be
a) 25 Hz b) 50 Hz c) 70.7Hz d) 100 Hz

113. Carbon, silicon and germanium atoms have four valence electrons each. Their valence and conduction bands are separated by energy band gaps represented by $\left(E_g\right)_C$, $\left(E_g\right)_{Si}$ and $\left(E_g\right)_{Ge}$ respectively. Which one of the following relationships is true in their case?
a) $\left(E_g\right)_C > \left(E_g\right)_{Si}$ b) $\left(E_g\right)_C < \left(E_g\right)_{Si}$ c) $\left(E_g^g\right)_C = \left(E_g^g\right)_{Si}$ d) $\left(E_g^g\right)_C < \left(E_g\right)_{Ge}$

114. Which of the following gates corresponds to the truth table given below?

Input		**Output**
A	**B**	**Y**
1	1	0
1	0	1
0	1	1
1	0	1

a) NAND b) OR c) AND d) XOR

115. The maximum wavelength of electromagnetic radiation, which can create a hole-electron pair in germanium. (Given that forbidden energy gap in germanium is 0.72 eV)
a) 1.7×10^{-6} m b) 1.5×10^{-5} m c) 1.3×10^{-4} m d) 1.9×10^{-5} m

116. The increases in the width of depletion region in a p-n junction diode is due to:
a) Increase in forward current b) Forward bias only c) Reverse bias only
d) Both forward bias and reverse bias

117. The depletion layer in the p-n junction region is caused by:
a) drift of holes b) diffusion of charge carriers c) migration of impurity ions
d) drift of electrons

118. The device that can act as a complete electronic circuit is:
a) junction diode b) integrated circuit c) junction transistor d) zener diode

119. The breakdown in a reverse biased p-n junction diode is more likely to occur due to

a) large velocity of the minority charge carriers if the doping concentration is small

b) large velocity of the minority charge carriers if the doping concentration is large

c) strong electric field in a depletion region if the doping concentration is small

d) none of these

120. Which one of the following is the weakest kind of the bonding in solids?
a) Ionic b) Metallic c) van der Waals d) Covalent

121. A potential barrier of 0.3 V exists across a p-n junction. If the depletion region is 1 urn wide, what is the intensity of electric field in this region?
a) 2 x $10^5 Vm^{-1}$ b) 3 x $10^5 Vm^{-1}$ c) 4 x $10^5 Vm^{-1}$ d) 5 x $10^5 Vm^{-1}$

122. The correct relationship between the two current gains a and b in a transistor is _____ .
a) b = $\frac{1+\alpha}{\beta}$ b) $\alpha = \frac{\beta}{1+\alpha}$ c) $\alpha = \frac{\beta}{1-\beta}$ d) $\beta = \frac{\alpha}{1+\alpha}$

123. The transfer ratio b of a transistor is 50. The input resistance of the transistor when used in the common emitter configuration is 1 kW. The peak value of the collector AC current for an AC input voltage of 0.01 V peak is:
a) 100 mA b) 0.01 mA c) 0.25 mA d) 500 mA

124. For an electronic valve, the plate current i and plate voltage V in the space charge limited region are related as:
a) i is proportional to $V^{3/2}$ b) i is proportional to $V^{2/3}$ c) i is proportional to V
d) i is proportional to V^2

125. In a common emitter (CE) amplifier having a voltage gain G, the transistor used has trans conductance 0.03 mho and current gain 25. If the above transistor is replaced with another one with trans conductance 0.02 mho and current gain 20, the voltage gain will be:
a) 2G/3 b) 1.5G c) G/3 d) 5G/4

126. In an unbiased p-n junction, holes diffuse from the p-region to n-region because of:
a) The potential difference across the p-n junction
b) The attraction of free electrons of n-region
c) The higher hole concentration in p-region than that in n-region
d) The higher concentration of electrons in the r-region than that in the p-region

127. Pure Si at 500 K has equal number of electrons n_e and holes. n_h concentration of 1.5 x 10^{16} m^{-3}. Doping by Indium increases nh to 4.5 x 10^{22} m^{-3}. The doped semiconductor is of :
a) n-type wit electron concentration n_e = 5 x 10^{22} m^{-3}
b) p-type wit electron concentration n_e = 2.5 x 10^{10} m^{-3}
c) n-type wit electron concentration n_e = 2.5 x 10^{23} m^{-3}
d) n-type wit electron concentration n_e = 5 x 10^9 m^{-3}

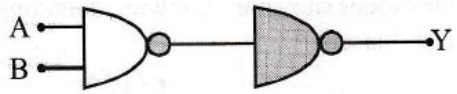
128. In a n-type semiconductor, which of the following statement is true?
a) Electrons are minority carriers and pentavalent atoms are dopants.
b) Holes are minority carriers and pentavalent atoms are dopants.
c) Holes are majority carriers and trivalent atoms are dopants.
d) Electrons are majority carriers and trivalent atoms are dopants.

129. Radiowaves of constant amplitude can be generated with

a) Rectifier b) Oscillator c) FET d) Filter

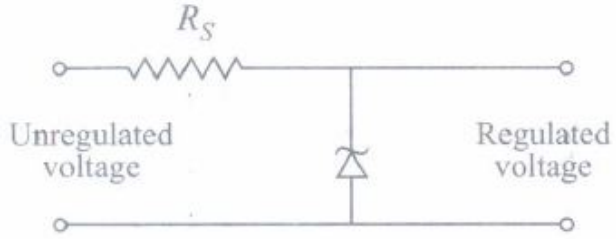
130. In Boolean algebra, if A = 1 and B = 0, then the value of $A + \bar{B}$ is
a) A b) A.B c) A + B d) both (a) and (c)

131. Following diagram performs the logic function of



a) XOR gate b) AND gate c) NAND gate d) OR gate

132. A Zener diode of power rating 1 W is to be used as a voltage regulator. If Zener has a breakdown of 5 V and it has to regulate voltage which fluctuated between 3 V and 7 V, what should be the value of R_S for safe operation?



a) 5Ω b) 10Ω c) 15Ω d) 20Ω

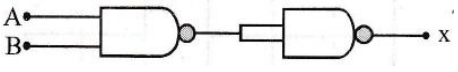
133. If a full wave rectifier circuit is operating from 50 Hz mains, the fundamental frequency in the ripple will be.
a) 100 Hz b) 25 Hz c) 50 Hz d) 70.7 Hz

134. The voltage gain of an amplifier with 9% negative feedback is 10. The voltage gain without feedback will be:
a) 90 b) 10 c) 125 d) 100

135. Which one of the following statement is false?
a) Pure Si doped with trivalent impurities gives ap-type semiconductor
b) Majority carriers in a n-type semicon-ductor are holes
c) Minority carriers in a p-type semicon-ductor are electrons
d) The resistance of intrinsic semicon-ductor decreases with increase of temperature

136. The number of beta particles emitted by a radioactive substance is twice the number of alpha particles emitted by it. The resulting daughter is an _____ .
a) isomer of parent b) isotone of parent c) isotope of parent d) isobar of parent

137. The output (X) of the logic circuit shown in figure will be:



a) $X = A \cdot B$ b) $X = A \cdot B$ c) $X = A + B$ d) $X = \bar{A}, \bar{B}$

138. Boolean algebra is essentially based on
a) number b) truth c) logic d) symbol

139. Sodium has body centred packing. Distance between two nearest atoms is $3.7\mathring{A}$. The lattice parameter is:
a) $4.3\mathring{A}$ b) $3.6\mathring{A}$ c) $8.6\mathring{A}$ d) $6.8\mathring{A}$

140. Transmission of light in optical fibre is due to:

a) Scattering b) Diffraction c) Polarisation d) Multiple total internal reflections

141. When an n-p-n transistor is used as an amplifier then:
a) the electrons flow from emitter to collector b) the holes flow from emitter to collector
c) the electrons flow from collector to emitter d) the electrons flow from battery to emitter

142. In a transistor connected in common emitter mode, $R_C = 4K\Omega$, $R_I = 1K\Omega$, I_C= 1mA and I_B = 20 μA .The voltage gain is
a) 100 b) 200 c) 300 d) 400

143. When a triode is used as an amplifier the phase difference between the input signal voltage and the output is:
a) zero b) $\frac{\pi}{4}$ c) $\frac{\pi}{2}$ d) P

144. The cause of the potential barrier in a p-n diode is:
a) Depletion of positive charges near the junction
b) Concentration of positive charges near the junction
c) Depletion of negative charges near the junction
d) Concentration of positive and negative charges near junction

145. In good conductors of electricity the type of bonding that exist is
a) Van der Walls b) covalent c) ionic d) metallic

146. The potential difference across the collector of a transistor, used in common emitter mode is 1.5 V, with the collector resistance of 3 kΩ , the emitter current is [β = 50]
a) 0.70 mA b) 0.49 mA c) 1.1 mA d) 1.9 mA

147. For CE transistor amplifier, the audio signal voltage across the collector resistance of 2kΩ is 4V. If the current amplification factor of the transistor is 100 and the base resistance is 1 kΩ, then the input signal voltage is
a) 10 mV b) 20 mV c) 30 mV d) 15 mV

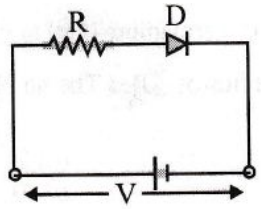
148. Which of the following equations correctly represents the temperature variation of energy gap between the conduction and valence bands for Si?
a) $E_g(T) = 0.70 - 2.23 \times 10^{-4} T$ eV b) $E_g(T) = 0.70 + 2.23 \times 10^{-4} T$ eV
c) $E_g(T) = 1.10 - 3.60 \times 10^{-4} T$ eV d) $E_g(T) = 1.10 + 3.60 \times 10^{-4} T$ eV

149. In a common base amplifier the phase difference between the input signal voltage and the output voltage is:
a) zero b) $\frac{\pi}{4}$ c) $\frac{\pi}{2}$ d) P

150. A common emitter amplifier has a voltage gain of 50, an input impedance of 100Ω and an output impedance of 200 Ω The power gain of the amplifier is :
a) 1000 b) 1250 c) 100 d) 500

151. A potential barrier of 0.50 V exists in a p-n junction. If the depletion region is 5.0×10^{-7}m thick, what is the electric field in this region?
a) $10^6 \quad V/m$ b) $10^7 \quad V/m$ c) $10^5 \quad V/m$ d) $10^4 \quad V/m$

152. A d.c. battery of V volt is connected to a series combination of a resistor R and an ideal diode D as shown in the figure. The potential difference across -R will be:



a) 2V when diode is forward biased b) Zero when diode is forward biased
c) V when diode is reverse biased d) V when diode is forward biased

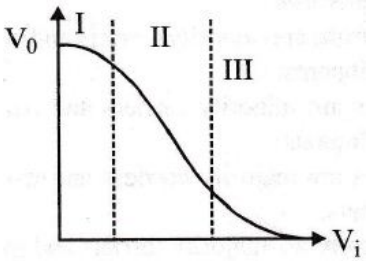
153. A semiconductor has equal electron and hole concentration of 6×10^8 per m^3 . On doping with certain impurity, electron concentration increases to 9×10^{12}per m^3. The new hole concentration is
a) $2x10^4$per m^3 b) $2x10^2$per m^3 c) 4×10^4per m^3 d) 4×10^2per m^3

154. When p-n junction diode is reverse biased the flow of current across the junction is mainly due to:
a) diffusion of charges b) drift of charges c) depends on the nature of material
d) both drift and diffusion of charges

155. Reverse bias applied to a junction diode:
a) increases the minority carrier current b) lower the potential barrier
c) raise the potential barrier d) increases the majority carrier current

156. If the energy of a photon of sodium light (λ = 589 nm) equals the band gap of semiconductor, the minimum energy required to create hole electron pair
a) 1.1eV b) 2.1eV c) 3.2eV d) 1.5eV

157. Transfer characteristics [output voltage (V_0) vs input voltage (V_1)] for a base biased transistor in CE configuration is as shown in the figure. For using transistor as a switch, it is used:

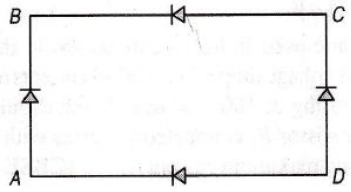


a) in region III b) both in region (I) and (III) c) in region II d) in region (I)

158. Mobilities of electrons and holes in a sample of intrinsic germanium at room temperature are 0.54 $m^2 V^{-1} s^{-1}$ and 0.18 $m^2 V^{-1} s^{-1}$ respectively. If the electron and hole densities are equal to 3.6×10^{19} m^{-3} the germanium conductivity is
a) 4.14 Sm^{-1} b) 2.12 Sm^{-1} c) 1.13 Sm^{-1} d) 5.6 Sm^{-1}

159. The current gain for a transistor working as common base amplifier is 0.96. If the emitter current is 7.2 mA, then the base current is _____ .
a) 0.29 mA b) 0.35 mA c) 0.39 mA d) 0.43 mA

160. In figure the input is across the terminals A and C and the output is across B and D. Then the output is:



a) zero b) same as the input c) half wave rectified d) full wave rectified

161. Which gate is represented by the following truth table?

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

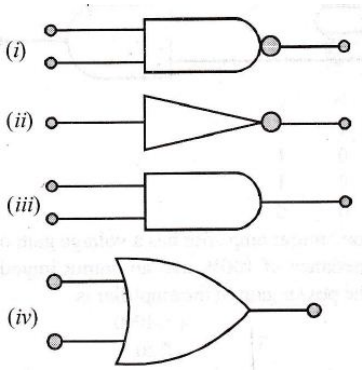
a) XOR b) NOT c) NAND d) AND

162. A semi-conducting device is connected in a series circuit with a resistance. a current is found to pass through the circuit. If the polarity of the battery is reversed, the current drops to almost zero. The device may be

a) a p-n junction b) an intrinsic semi-conductor c) a p-tpe semi-conductor

d) an n-type semiconductor

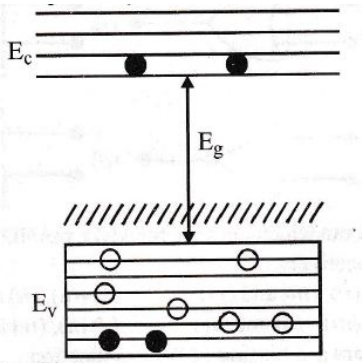
163. The symbolic representation of four logic gates are given below:



The logic symbols for OR, NOT and NAND gates are respectively:

a) (iv), (i), (iii) b) (iv), (ii), (i) c) (i), (iii), (iv) d) (iii), (iv), (ii)

164. In the energy band diagram of a material shown below, the open circles and filled circles denote holes and electrons respectively. The material is"



a) an insulator b) a metal c) an n-type semiconductor d) a p-type semiconductor

165. A p-n photodiode is made of a material with a band gap of 2 eV .The minimum frequency of the radiation that can be absorbed by the material is nearly (hc = 1240 eV nm)

a) 1 x 10^{14} Hz b) 20 x 10^{14} Hz c) 10 X 10^{14} Hz d) 5 x 10^{14} Hz

166. The current gain for a common emitter amplifier is 69. If the emitter current is 7 mA, the base current is

a) 0.1 mA b) 1 mA c) 0.2 mA d) 2 mA

167. In semiconductors, at room temperature:

a) the conduction band is completely empty

b) the valence band is partially empty and conduction band is completely filled

c) the valence band is partially empty and the conduction band is partially filled

d) the valence band is completely filled

168. A transistor connected in common emitter mode, the voltage drop across the collector is 2 V and β is 50, the base current if R_c is 2 kΩ is

a) 40μA b) 20μA c) 30 μA d) 15μA

169. Which one of the following represents forward bias diode?

a) 

b) 

c) 

d) 

170. Depletion layer consists of:

a) Electrons b) Protons c) Mobile charge carriers d) Immobile ions

171. At absolute zero, Si acts as:

a) Non-metal b) Metal c) Insulator d) None of the above

172. The power gain for common base amplifier is 800 and the voltage amplification factor is 840. The collector current when base current is 1.2mA is

a) 24 mA b) 12 mA c) 6 mA d) 3 mA

173. One way in which the operation of a n-p-n transistor differs from that of a p-n-p:

a) The emitter junction is reversed biased in n-p-n

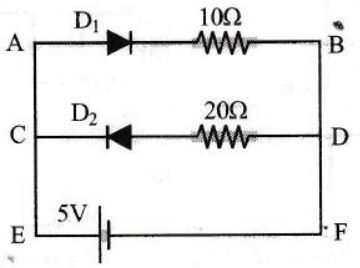
b) The emitter junction injects minority carriers into the base region of the p-n-p

c)

The emitter injects holes into the base of the p-n-p and electrons into the base region of n-p-n

d) The erritter injects holes into the base of n-p-n

174. Two ideal diodes are connected to a battery as shown in the circuit. The current supplied by the battery is:



a) 0.75 A b) zero c) 0.25 A d) 0.5 A