GPLUS EDUCATION

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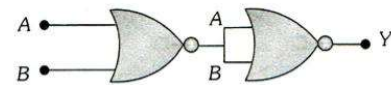Time   :   PHYSICS
Marks :

SEMICONDUCTOR ELECTRONICS: MATERIALS, DEVIES AND SIMPLE CIRCUITS

Single Correct Answer Type

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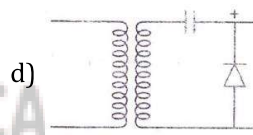

A B Y

a)
$\begin{vmatrix} 0 & 0 & 0 \\ 0 & 1 & 0 \\ 1 & 0 & 0 \\ 1 & 1 & 1 \end{vmatrix}$
b)
$\begin{vmatrix} 0 & 0 & 1 \\ 0 & 1 & 1 \\ 1 & 0 & 1 \\ 1 & 1 & 0 \end{vmatrix}$
c)
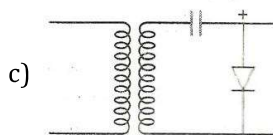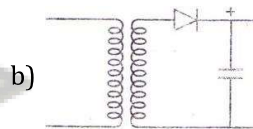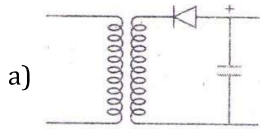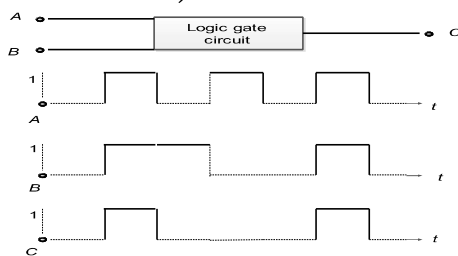$\begin{vmatrix} 0 & 0 & 1 \\ 0 & 1 & 0 \\ 1 & 0 & 0 \\ 1 & 1 & 0 \end{vmatrix}$
d)
$\begin{vmatrix} 0 & 0 & 0 \\ 0 & 1 & 1 \\ 1 & 0 & 1 \\ 1 & 1 & 1 \end{vmatrix}$

2. Which is the correct diagram of a half-wave rectifier?

a)   b)

c)   d)

3. 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) AND gate   b) NAND gate   c) NOR gate   d) OR gate

4. When the forward bias voltage of a diode is changed from 0.6 V to 0.7 V, the current changes from 5 mA to 15 mA. Then its forward bias resistance is
a) 0.01 Ω   b) 0.1 Ω   c) 10 Ω   d) 100 Ω

5. In extrinsic P and N-type semiconductor materials, the ratio of the impurity atoms to the pure semiconductor atoms is about
a) 1   b) 10^{-1} c) 10^{-4} d) 10^{-7}

6. In the following, which one of the diodes is reverse biased?

a)   b)

c)   d)
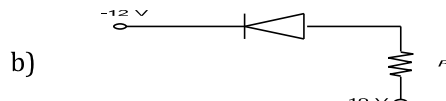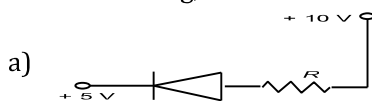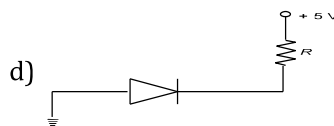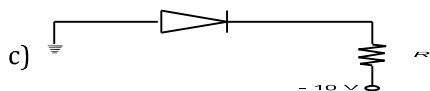
7. In a triode, cathode, grid and plate are at $0, -2$ and $80\ V$ respectively. The electrons are emitted from the cathode with energy $3\ eV$. The energy of the electron reaching the plate is

   a) $77\ eV$ b) $85\ eV$ c) $81\ eV$ d) $83\ eV$

8. The current gain α of a transistor is 0.9. The transistor is connected to common base configuration. What would be the change in collector current when base current changes by 4 mA?

   a) 1.2 mA   b) 12 mA   c) 24 mA   d) 36 mA

9. In Boolean algebra, $\overline{\overline{A} \cdot \overline{B}}$ is equal to

   a) $\overline{A} \cdot \overline{B}$ b) $\overline{A} + \overline{B}$ c) $A \cdot B$ d) $A + B$

10. In *n-p-n* transistor, in *CE* configuration

    (1) The emitter is heavily doped than the collector.
    (2) Emitter and collector can be interchanged.
    (3) The base region is very thin but is heavily doped.
    (4) The conventional current flows from base to emitter.

    a) (1) and (2) are correct   b) (1) and (3) are correct
    c) (1) and (4) are correct   d) (2) and (3) are correct

11. The transistors provide good power amplification when they are used in

    a) Common collector configuration   b) Common emitter configuration
    c) Common base configuration   d) None of these

12. The voltage gain of the following amplifier is
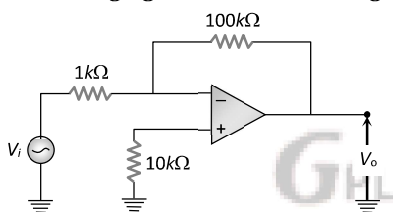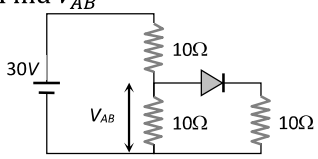
    a) 10   b) 100   c) 1000   d) 9.9

13. The truth table given below is for (A and B are the inputs, Y is the output)

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

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

14. The circuit shown in the figure contains two diodes each with a forward resistance of 30 Ω and with infinite backward resistance. If the battery is 3V, the current through the 50 Ω resistance (in ampere) is
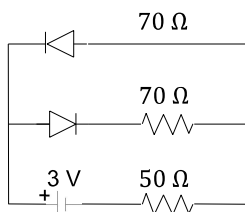
    a) Zero   b) 0.01   c) 0.02   d) 0.03

15. The potential in depletion layer is due to

    a) Electrons   b) Holes   c) Ions   d) Forbidden band

16. Pure Si at 500 K has equal number of electron (n_e) and hole (n_h) concentrations of $1.5 \times 10^{16} m^{-3}$. Doping by indium increases n_h to $4.5 \times 10^{22} m^{-3}$. The doped semiconductor is of
    a) n −type with electron concentration $n_e = 2.5 \times 10^{23} m^{-3}$
    b) p −type having electron concentration $n_e = 5 \times 10^9 m^{-3}$
    c) n −type with electron concentration $n_e = 5 \times 10^{22} m^{-3}$
   d) p −type with electron concentration $n_e = 2.5 \times 10^{10} m^{-3}$

17. A p-n photodiode is made of a material with a band gap of 2.0 eV. The minimum frequency of the radiation that can be absorbed by the material is nearly
    a) 10×10^{14} Hz   b) 5×10^{14} Hz   c) 1×10^{14} Hz   d) 20×10^{14} Hz

18. In an intrinsic semiconductor, the Fermi level is
    a) Nearer to valency band than conduction band
    b) Equidistance from conduction band and valency band
    c) Nearer to conduction band than valency band
    d) Bisecting the conduction band

19. A common emitter amplifier is designed with NPN transistor ($\alpha = 0.99$). The input impedance is 1 $K\Omega$ and load is 10 $K\Omega$. The voltage gain will be
    a) 9.9   b) 99   c) 990   d) 9900

20. Find V_{AB}

    a) 10 V b) 20 V c) 30 V d) None of these

21. In a transistor the collector current is always less than the emitter current because
    a) Collector side is reverse biased and the emitter side is forward biased
    b) A few electrons are lost in the base and only remaining ones reach the collector
    c) Collector being reverse biased, attracts less electrons
    d) Collector side is forward biased and the emitter side is reverse biased

22. A NPN transistor conducts when
    a) Both collector and emitter are positive with 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

23. In CE mode, the input characteristics of a transistor is the variation of
    a) I_B against V_{BE} at constant V_{CE} b) I_C against V_{CE} at constant V_{BE}
    c) I_B against I_C d) I_E against I_C

24. An n-p-n transistor power amplifier in CE configuration gives
    a) Voltage amplification only
    b) Currents amplification only
    c) Both current and voltage amplifications
    d) Only power gain of unity

25. Formation of covalent bonds in compounds exhibits
    a) Wave nature of electron
    b) Particle nature of electron
    c) Both wave and particle nature of electron
    d) None of the above

26. The current gain of a transistor in common base mode is 0.995. the current gain of the same transistor in common emitter mode is
    a) 197   b) 201   c) 198   d) 199

27. If no external voltage is applied across *P-N* junction, there would be
    a) No electric field across the junction
    b) An electric field pointing from *N*-type to *P*-type side across the junction
    c) An electric field pointing from *P*-type to *N*-type side across the junction
    d) A temporary electric field during formation of *P-N* junction that would subsequently disappear
28. The temperature coefficient of resistance of a semiconductor
    a) Is always positive   b) Is always negative
    c) Is zero   d) May be positive or negative or zero
29. Solids having highest energy level partially filled with electrons are
    a) Semiconductor   b) Conductor   c) Insulator   d) None of these
30. Intrinsic germanium and silicon at absolute zero temperature behave like
    a) Superconductor   b) Good semiconductor   c) Ideal insulator   d) Conductor
31. In a common emitter transistor amplifier $\beta = 60, R_0 = 5000\Omega$ and internal resistance of a transistor is 500Ω. The voltage amplification of amplifier will be
    a) 500   b) 460   c) 600   d) 560
32. The truth table shown in figure is for

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

    a) XOR   b) AND   c) XNOR   d) OR
33. The valency of the impurity atom that is to be added to germanium crystal so as to make it a *N*-type semiconductor, is
    a) 6   b) 5   c) 4   d) 3
34. Carbon, silicon and germanium have four valence electrons each. At room temperature which one of the following statements is more appropriate?
    a) The number of free conduction electrons is significant in C but small in Si and Ge
    b) The number of free conduction electrons is negligibly small in all the three
    c) The number of free electrons for conduction is significant in all the three
    d) The number of free electrons for conduction is significant only in Si and Ge but small in C
35. In a common emitter amplifier, using output resistance of 5000 Ω and input resistance of 2000 Ω, if the peak value of input signal voltage is 10 mV and $\beta = 50$, then peak value of output voltage is
    a) 5×10^{-6} V   b) 12.50×10^{-6} V   c) 1.25 V   d) 125.0 V
36. At room temperature, a *P*-type semiconductor has
    a) Large number of holes and few electrons
    b) Large number of free electrons and few holes
    c) Equal number of free electrons and holes
    d) No electrons or holes
37. The output of a NAND gate is 0
    a) If both inputs are 0
    b) If one input is 0 and the other input is 1
    c) If both inputs are 1
    d) Either if both inputs are 1 or if one of the inputs is 1 and the other 0
38. For a junction diode the ratio of forward current (I_F) and reverse current (I_r) 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) $(e^{-eV/kT} + 1)$ d) $(e^{eV/kT} - 1)$
39. What is the name of the level formed due to impurity atom in *p*-type in the forbidden gap?
    a) Donor level   b) Acceptor level   c) Conduction level   d) Forbidden level
40. Which of the following gates will have an output of 1

a)   b)   c)   d)
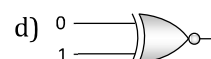
41. In N-type semiconductors, majority charge carriers are
   a) Holes   b) Protons   c) Neutrons   d) Electrons

42. A gate has the following truth table

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

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

43. In the circuit of a triode value, there is no change in the plate current, when the plate potential is increased from 200 V to 220 V and the grid potential is decreased from -0.5 V to -1.3 V. The amplification factor of the valve is
   a) 15   b) 20   c) 25   d) 35

44. The electrical circuit used to get smooth DC output from a rectifier circuit is called
   a) Filter   b) Oscillator   c) Logic gates   d) Amplifier

45. Transfer characteristics [output voltage (V_0) vs input voltage (V_i)] for a base biased transistor in CE configuration is as shown in the figure. For using transistor as a switch, it is used
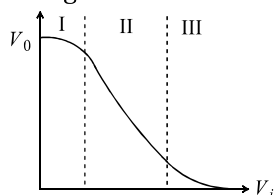
   a) In region III   b) Both in region (I) and (III)
   c) In region II   d) In region I

46. The unit of mutual conductance of a triode valve is
   a) Siemen   b) Ohm c) $Ohm\ metre$ d) $Joule\ coulomb^{-1}$

47. In a triode amplifier, the value of maximum gain is equal to
   a) Half the amplification factor   b) Amplification factor
   c) Twice the amplification factor   d) Infinity

48. In the following common emitter circuit if $\beta = 100, V_{CE} = 7V, V_{BE} = $ negligible, $R_C = 2\ k\Omega$ then $I_B =?$
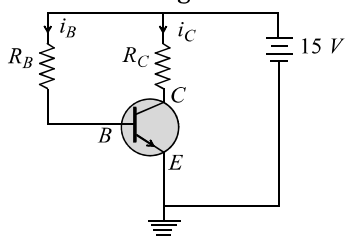
   a) $0.01\ mA$ b) $0.04\ mA$ c) $0.02\ mA$ d) $0.03\ mA$

49. P-type semiconductor is formed when
   A. As impurity is mixed in Si
   B. Al impurity is mixed in Si
   C. B impurity is mixed in Ge
   D. P impurity is mixed in Ge
   a) A and C   b) A and D   c) B and C   d) B and D

50. A piece of semiconductor is connected in series in an electric circuit. On increasing the temperature, the current in the circuit will
   a) Decrease   b) Remain unchanged   c) Increase   d) Stop flowing
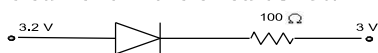
51. The relation between number of free electrons (n) is a semiconductor and temperature (T) is given by
   a) $n \propto T$ b) $n \propto T^2$ c) $n \propto \sqrt{T}$ d) $n \propto T^{3/2}$

52. A zener diode, having breakdown voltage equal to 15 V, is used in a voltage regulator circuit shown in figure. The current through the diode is
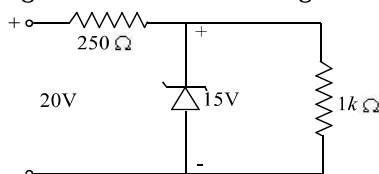

a) 20 mA b) 5 mA c) 10 mA d) 15 mA

53. The current in the circuit shown in the figure, considering ideal diode is

a) 20 A   b) 2×10^{-3} A   c) 200 A   d) 2×10^{-4} A

54. 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 milli-watt. What should be the value of the resistance R, connected in series with the diode, for obtaining maximum current?


a) 1.5 Ω   b) 5 Ω   c) 6.67 Ω   d) 200 Ω
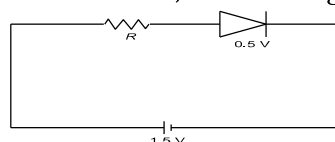
55. A p-type material is electrically …….
    a) Positive
    b) Negative
    c) Neutral
    d) Depends on the concentration of p impurities

56. Which of the following statements is not correct when a junction diode is in forward bias?
    a) The width of depletion region decreases.
    b) Free electrons on n-side will move towards the junction.
    c) Holes on p-side move towards the junction.
    d) Electrons on n-side and holes on p-side will move away from junction.

57. For a common emitter amplifier, the audio signal voltage across the collector resistance 2kΩ is 2 V. If the current amplification factor of the transistor is 220, and the base resistance is 1.5 Ω, the input signal voltage and base current are
    a) 0.1 V and 1 μA   b) 0.15 V and 10 μA   c) 1.015 V and 1 A   d) 0.0075 V and 5 μA

58. The relation between dynamic plate resistance (r_p) of a vacuum diode and plate current in the space charge limited region, is

    a) $r_p \propto I_p$ b) $r_p \propto I_p^{3/2}$ c) $r_p \propto \dfrac{1}{I_p}$ d) $r_p \propto \dfrac{1}{\left(I_p\right)^{1/3}}$

59. The forbidden energy gap in Ge is 0.72 eV, given, $hc = 12400$ eV-Å. The maximum wavelength of radiation that will generate electron hole pair is
    a) 172220 Å   b) 172.2 Å   c) 17222 Å   d) 1722 Å

60. If the forward voltage in a semiconductor diode is changed from 0.5 V to 0.7 V, then the forward current changes by 1.0 mA. The forward resistance of diode junction will be
    a) 100 Ω   b) 120 Ω   c) 200 Ω   d) 240 Ω

61. Two identical $p - n$ junction may be connected in series with a battery in three ways as shown in the adjoining figure. The potential drop across the $p - n$ junctions are equal in
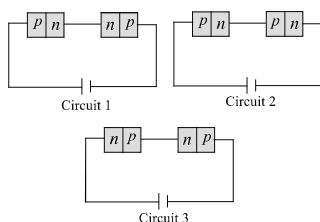
a) Circuit 1 and circuit 2   b) Circuit 2 and circuit 3   c) Circuit 3 and circuit 1   d) Circuit 1 only

62. While a collector to emitter voltage is constant in a transistor, the collector current changes by $8.2\ mA$ when the emitter current changes by $8.3\ mA$. The value of forward current ratio h_{fe} is

    a) 82   b) 83   c) 8.2   d) 8.3

63. The mobility of free electron is greater than that of free holes because
    a) The carry negative charge
    b) They are light
    c) They mutually collide less
    d) They require low energy to continue their motion

64. Any digital circuit can be realised by repetitive use of only
    a) NOT gate   b) OR gate   c) AND gate   d) NOR gate

65. In $p-n$ junction, the barrier potential offers resistance to
    a) Free electrons in n-region and holes in –region
    b) Free electrons in p-region and holes in n-region
    c) Only free electrons in n-region
    d) Only holes in p-region

66. Would there be any advantage to adding n-type or p-type impurities to copper
    a) Yes   b) No
    c) May be   d) Information is insufficient

67. The coordination number of hexagonal close packing (hcp) is
    a) 6   b) 8   c) 12   d) 16

68. A p-n junction (D) shown in the figure can act as a rectifier. An alternating current source (V) is connected in the circuit.
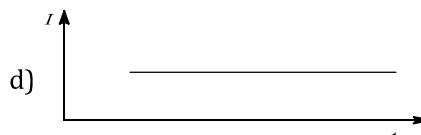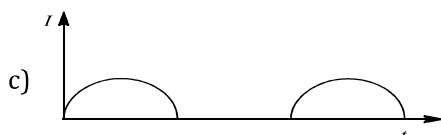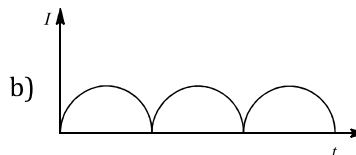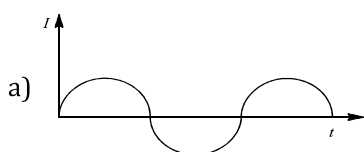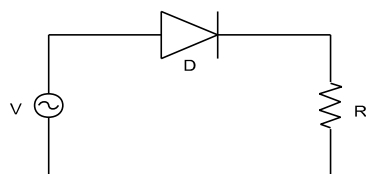
69. The frequency response curve of RC coupled amplifier is shown in figure. The band width of the amplifier will be
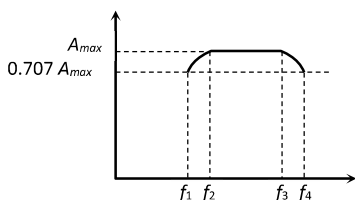
a) $f_3 - f_2$ b) $f_4 - f_1$ c) $\dfrac{f_4 - f_2}{2}$ d) $f_3 - f_1$

70. The typical ionisation energy of a donor in silicon is
     a) $10.0\,eV$ b) $1.0\,eV$ c) $0.1\,eV$ d) $0.001\,eV$

71. Consider the following statements 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 forward bias
     B. In an intrinsic semiconductor the fermi energy level is exactly 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

72. Within depletion region of p-n junction diode
     a) p-side is positive and n-side is negative
     b) p-side is negative and n-side is positive
     c) Both sides are positive or both negative
     d) Both side are neutral

73. The introduction of a grid in a triode valve affects plate current by
     a) Making the thermionic emission easier at low temperature
     b) Releasing more electrons from the plate
     c) Increasing plate voltage
     d) Neutralizing space charge

74. In an unbiased p-n junction
     a) Potential at p is more than that at n b) Potential at p is less than that at n
     c) Potential at p is equal to that at n d) Potential at p is +ve and that at n is −ve

75. In presence of interspace charge, at plate voltage of 200 V, the current is 80 mA. Then the current in mA at 400 V will be
     a) $160\sqrt{2}$ b) $2\sqrt{2}$ c) $80/\sqrt{2}$ d) None of these

76. 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 the junction

77. Consider the following statement A and B and identify the correct choice of the given answers
     (A) A zener diode is always connected in reverse bias
     (B) The potential barrier of a PN junction lies between 0.1 to 0.3 V 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

78. In circuit in following fig. the value of Y is
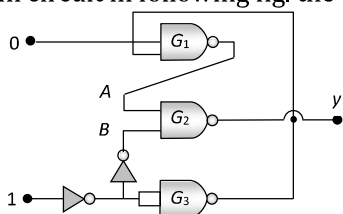
     a) 0
     b) 1

c) Fluctuates between 0 and 1

d) Indeterminate as the circuit can't be realised

79. Resistance of a semiconductor

a) Increases with increase in temperature

b) Decreases with increase in temperature

c) Is not affected by change in temperature

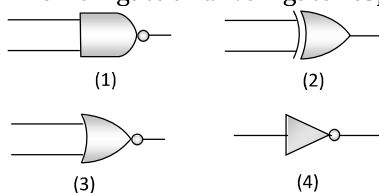d) Increase for germanium and decrease for silicon

80. Ge and Si diodes conduct at 0.3 V and 0.7 V respectively. In the following figure if Ge diode connection is reversed, the value of V_0 changes by
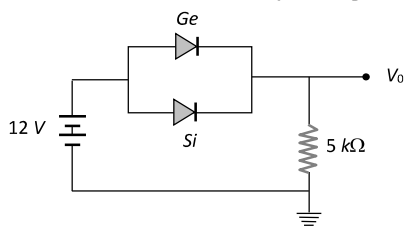
a) 0.2 V b) 0.4 V c) 0.6 V d) 0.8 V

81. Given below are symbols for some logic gates

The XOR gate and NOR gate respectively are

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

82. A diode having potential difference 0.5 V across its junction which does not depend on current, is connected in series with resistance of 20Ω across source. If 0.1 A current passes through resistance then what is the voltage of the source?

a) 1.5 V   b) 2.0 V   c) 2.5 V   d) 5 V

83. In a common emitter amplifier the input signal is applied across

a) Anywhere   b) Emitter-collector   c) Collector-base   d) Base-emitter

84. In the adjacent circuit, A and B represent two inputs and C represents the output. The circuit represents
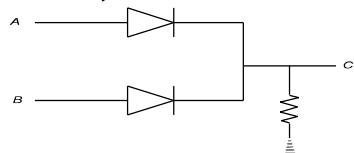
a) NOR gate   b) AND gate   c) NAND gate   d) OR gate

85. The slope of plate characteristic of a vacuum tube diode for certain operating point on the curve is $10^{-3} \frac{mA}{V}$. The plate resistance of the diode and its nature respectively

a) 100 $kilo\text{-}ohms$ static

b) 1000 $kilo\text{-}ohms$ static

c) 1000 $kilo\text{-}ohms$ dynamic

d) 100 $kilo\text{-}ohms$ dynamic

86. In NPN transistor, 10^{10} electrons enter in emitter region in $10^{-6}s$. If 2% electrons are lost in base region then collector current and current amplification factor (β) respectively are

a) 1.57 mA, 49   b) 1.92 mA, 70   c) 2 mA, 25   d) 2.25 mA, 100

87. The crystal structure can be studied by using

a) UV raus   b) X-rays   c) IR radiation   d) Microwaves

88. In a transistor the base is

a) An insulator

b) A conductor of low resistance

c) A conductor of high resistance

d) An extrinsic semiconductor

89. A strip of copper and another of germanium are cooled from room temperature to 80 K. the resistance of
    a) Each of these decreases
    b) Copper strip increases and that of germanium decreases
    c) Copper strip decreases and that of germanium increases
   d) Each of the above increases

90. Number of secondary electrons emitted per number of primary electrons depends on
    a) Material of target
    b) Frequency of primary electrons
    c) Intensity
    d) None of the above

91. In the following combinations of losgic gates, the outputs of A, B and C are respectively
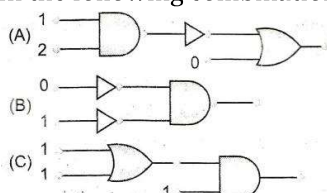
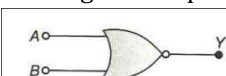   a) 0, 1, 1   b) 0, 1, 0   c) 1, 1, 0   d) 1, 0, 1

92. In the circuit given A, B and C are inputs and Y is the output
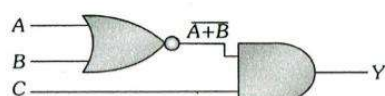
    The output of Y is
    a) High for all the high inputs
    b) High for all the low inputs
    c) High when $A = 1, B = 1, C = 0$
    d) Low for all low inputs

93. Which gate is represented by the symbolic diagram given here?

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

94. The device that can act as a complete electronic circuit is
    a) Zener diode   b) Junction diode   c) Integrated circuit   d) Junction transistor

95. Consider a p-n junction as a capacitor, formed with p and n-materials acting as thin metal electrodes and depletion layer width acting as separation between them. Basing on this, assume that a n-p-n transistor is working as an amplifier in CE configuration. If C_1 and C_2 are the base-emitter and collector-emitter junction capacitances, then
    a) $C_1 > C_2$ b) $C_1 < C_2$ c) $C_1 = C_2$ d) $C_1 = C_2 = 0$

96. Wires P and Q have the same resistance at ordinary (room) temperature. When heated, resistance of P increases and that of Q decreases. We conclude that
    a) P and Q are conductors of different materials
    b) P is N-type semiconductor and Q is P-type semiconductor
    c) P is semiconductor and Q is conductor
    d) P is conductor and Q is semiconductor

97. When a semiconductor is heated, its resistance
    a) Decreases   b) Increases   c) Remains unchanged   d) Nothing is definite

98. In a common base amplifier circuit, calculate the change in base current if that in the emitter current is 2 mA and $\alpha = 0.98$
    a) 0.04 mA   b) 1.96 mA   c) 0.98 mA   d) 2 mA

99. A triode whose mutual conductance is 2.5 $m\,A/volt$ and anode resistance is 20 $kilo\ ohm$, is used as an amplifier whose amplification is 10. The resistance connected in plate circuit will be
    a) 1 $k\Omega$ b) 5 $k\Omega$ c) 10 $k\Omega$ d) 20 $k\Omega$

100. An electron-hole pair is formed when light of maximum wavelength 6000 Å is incident on the semiconductor. What is the band gap energy of the semiconductor?
$(h = 6.62 \times 10^{-34}$ J-s)
a) 3.31×10^{-19} J
b) 3.07×10^{-19} J
c) 2.07×10^{-19} J
d) 2.07 J

101. If a full wave rectifier circuit is operating from 50Hz mains, the fundamental frequency in the ripple will be
a) 70.7 Hz
b) 100 Hz
c) 25 Hz
d) 59 Hz

102. In a cubic unit cell of bcc structure, the lattice points (ie, number of atoms) are
a) 2
b) 6
c) 8
d) 12

103. The output in the circuit of figure is taken across a capacitor. It is as shown in figure
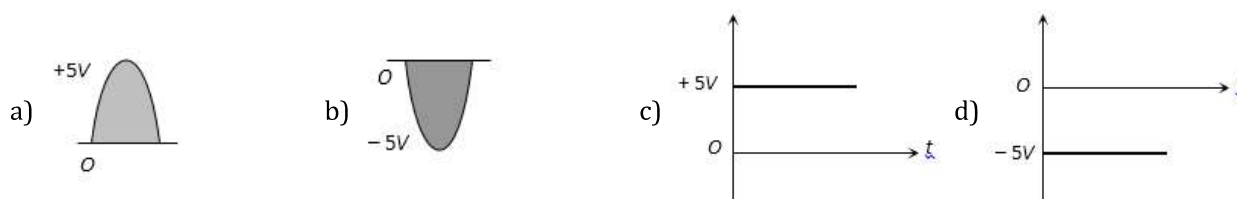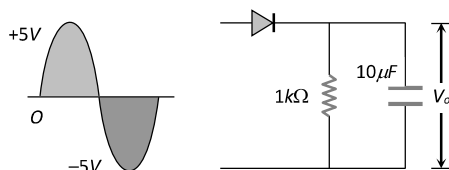
104. Two identical capacitors A and B are charged to the same potential V and are connected in two circuits at $t = 0$, as shown in figure. The charge on the capacitors at time $t = CR$ are respectively
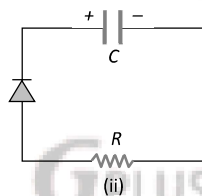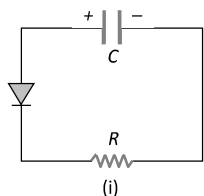
a) VC, VC
b) $\dfrac{VC}{e}, VC$
c) $VC, \dfrac{VC}{e}$
d) $\dfrac{VC}{e}, \dfrac{VC}{e}$

105. If D_e, D_b and D_c are the doping levels of emitter, base and collector respectively of a transistor, then
a) $D_e = D_b = D_c$
b) $D_e < D_b = D_c$
c) $D_e > D_b > D_c$
d) $D_e > D_c > D_b$

106. The saturation current in a diode valve is governed by
a) Child's law
b) Len's law
c) Richardson's law
d) Ampere's law

107. Which of the following does not vary with plate or grid voltages
a) g_m
b) R_p
c) μ
d) Each of them varies

108. A zener diode has a contact potential of 1 V in the absence of biasing. It undergoes Zener breakdown for an electric field of 10^6 V-m^{-1} at the depletion region of p-n junction. If the width of the depletion region is 2.5 μm, what should be the reverse biased potential for the Zener breakdown to occur?
a) 3.5 V
b) 2.5 V
c) 1.5 V
d) 0.5 V

109. In order to prepare a p-type semiconductor, pure silicon can be doped with
a) Phosphorus
b) Aluminium
c) Antimony
d) Germanium

110. The output wave form of full-wave rectifier is

c)   d)
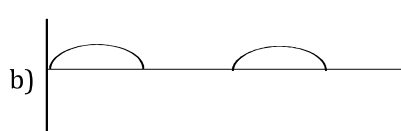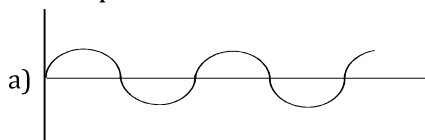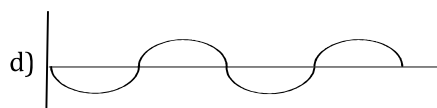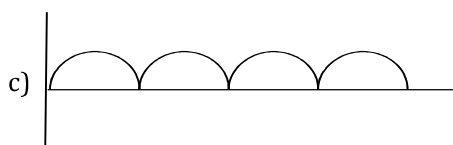
111. The plate current in a vacuum diode depends on
    a) Cathode temperature only
    b) Plate voltage only
    c) Both plate voltage and cathode temperature
    d) None of these

112. The depletion layer of a *p-n* junction
    a) Is of constant width irrespective of the bias
    b) Acts like an insulating zone under reverse bias
    c) Has a width that increases with an increase in forward bias
    d) Is depleted of ions

113. In a transistor the collector current is always less than the emitter current because
   a) Collector side is reverse biased and the emitter side is forward biased
    b) A few electrons are lost in the base and only remaining ones reach the collector
    c) Collector being reverse biased, attracts less electrons
    d) Collector side is forward biased and emitter side is reverse biased

114. Figure shows a diode connected to an external resistance and an emf. Assuming that the barrier potential developed in diode is 0.5 V, obtain the value of current in the circuit in milli ampere.
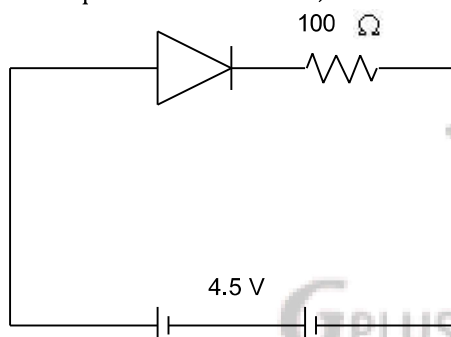
    a) 40 mA   b) 60 mA   c) 80 mA   d) 100 mA

115. Which of the following is a dichroic crystal
    a) Mica   b) Selenite   c) Quartz   d) Tourmaline

116. Zener breakdown in a semi-conductor diode occurs when
    a) Forward current exceeds certain value
    b) Reverse bias exceeds certain value
    c) Forward bias exceeds certain value
    d) Potential barrier is reduced to zero

117. The band gap in germanium and silicon in *eV* respectively is
    a) 0.7, 1.1   b) 1.1, 0.7   c) 1.1, 0   d) 0, 1.1

118. 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

119. A photodetector used to detect the wavelength of 1700 nm, has energy gap of about
    a) 0.073 eV   b) 1.2 eV   c) 7.3 eV   d) 0.73 eV

120. A piece of copper and another of germanium are cooled from room temperature to 77 K, the resistance of
    a) Each of them increases
    b) Each of them decreases
    c) Copper decreases and germanium increases
    d) Copper increases and germanium decreases

121. Which of the following has negative temperature coefficient of resistance
    a) Copper   b) Aluminium   c) Iron   d) Germanium

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

a)

b)

c)

d)
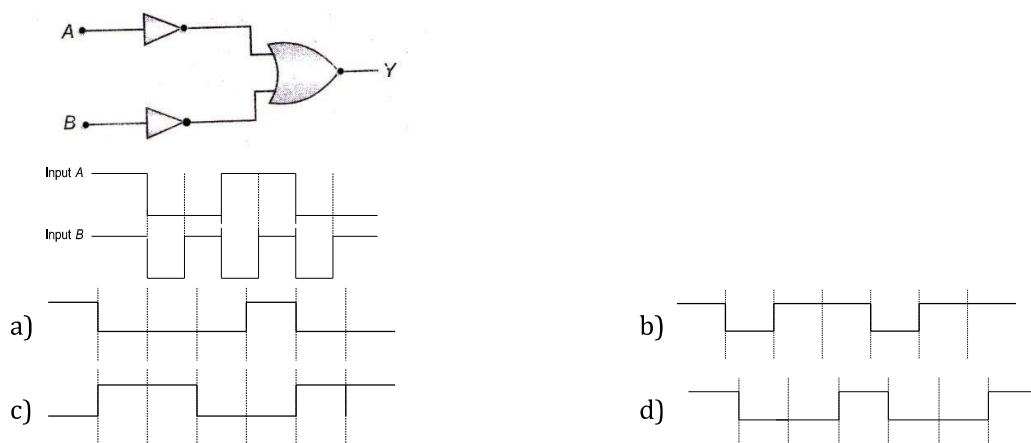
123. In an n-type semiconductor, the fermi energy level lies
   a) In the forbidden energy gap nearer to the conduction band
    b) In the forbidden energy gap nearer to the valence band
    c) In the middle of forbidden energy gap
    d) Outside the forbidden energy gap

124. The combination of gates shown below yields
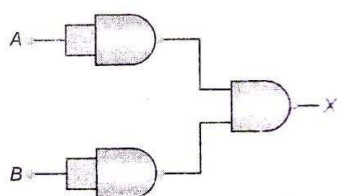
    a) OR gate   b) NOT gate   c) XOR gate   d) NAND gate

125. In Colpitt oscillator the feedback network consists of
    a) Two inductors and a capacitor   b) Two capacitors and an inductor
    c) Three pairs of RC circuit   d) Three pairs of RL circuit

126. Which of the following is an amorphous substance?
    a) Gold   b) Silver   c) Copper   d) Glass

127. The phenomenon of thermionic emission was discovered by
    a) Marcoini   b) Fleming   c) Forest   d) Thomas Edison

128. For a given triode $\mu = 20$. The load resistance is 1.5 times the anode resistance. The maximum gain will be
    a) 16   b) 12   c) 10   d) None of the above

129. A metallic surface with work function of $2\ eV$, on heating to a temperature of $800\ K$ gives an emission current of $1\ mA$. If another metallic surface having the same surface area, same emission constant but work function $4\ eV$ is heated to a temperature of $1600\ K$, then the emission current will be
    a) $1\ mA$ b) $2\ mA$ c) $4\ mA$ d) None of these

130. In a NPN transistor, 108 electrons enter the emitter in $10^{-8}s$. If 1% electrons are lost in the base, the fraction of current that enters the collector and current amplification factor are respectively
    a) 0.8 and 49   b) 0.9 and 90   c) 0.7 and 50   d) 0.99 and 99

131. The value of current in the following diagram will be
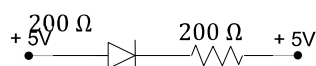
    a) Zero   b) 10^{-2} A   c) 10 A   d) 0.025 A

132. In a $p - n$ junction diode

a) The current in the reverse biased condition is generally very small

b) The current in the reverse biased condition is small but the forward biased current is independent of the bias voltage

c) The reverse biased current is strongly dependent on the applied bias voltage

d) The forward biased current is very small in comparison to reverse biased current

133. In depletion layer of unbiased p-n junction

   a) Holes are present   b) Electrons are present

   c) Only fixed ions are present   d) None of the above

134. Electronic configuration of germanium is 2, 8, 18 and 4. To make it extrinsic semiconductor small quantity of antimony is added

a) The material obtained will be N-type germanium in which electrons and holes are equal in number

b) The material obtained will be P-type germanium

c) The material obtained will be N-type germanium which has more electrons than holes at room temperature

d) The material obtained will be N-type germanium which has less electrons than holes at room temperature

135. The given truth table is of

A	X
0	1
1	0

   a) OR gate   b) AND gate   c) NOT gate   d) None of above

136. In the circuit shown in figure the maximum output voltage V_0 is
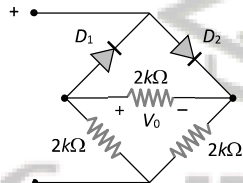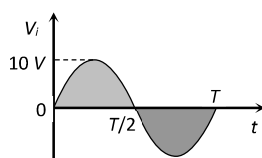
   a) 0 V b) 5 V c) 10 V d) $\dfrac{5}{\sqrt{2}}V$

137. The combination of gates shown below produces
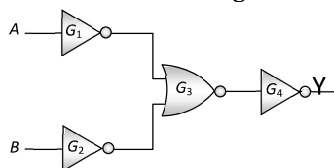
   a) AND gate   b) XOR gate   c) NOR gate   d) NAND gate

138. What is the coordination number of sodium ions in the case of sodium chloride structure

   a) 6   b) 8   c) 4   d) 12

139. What is the output of the combination of the gates shown in the figure?
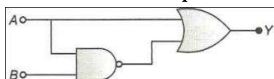
   a) $A + \overline{\overline{A} \cdot B}$ b) $(A + B) + (\bar{A} \cdot \bar{B})$ c) $(A + B) \cdot (\overline{\bar{A} \cdot B})$ d) $(A + B) \cdot (\bar{A} + \bar{B})$

140. In silicon when phosphorus is doped ……. is formed

   a) p-type semiconductor   b) n-type semiconductor

   c) p-n junction   d) None of these

141. If n_e and v_d be the number of electrons and drift velocity in a semiconductor. When the temperature is increased

   a) n_e increases and v_d decreases   b) n_e decreases and v_d increases

   c) Both n_e and v_d increases   d) Both n_e and v_d decreases

142. To get an output 1 from the circuit shown in the figure, the input must be
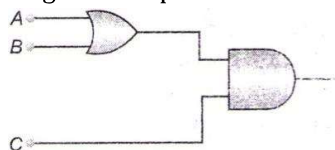
   a) $A = 0, B = 1, C = 0$ b) $A = 1, B = 0, C = 0$ c) $A = 1, B = 0, C = 1$ d) $A = 1, B = 1, C = 0$

143. When a p-n junction diode is reverse biased, then
   a) No current flows
   b) The depletion region is increased
   c) The depletion region is reduced
   d) The height of the potential barrier is reduced

144. When phosphorus and antimony are mixed in germanium, then
   a) P-type semiconductor is formed   b) N-type semiconductor is formed
   c) Both (a) and (b)   d) none of these

145. Semiconductor material having fewer free electrons than pure germanium or silicon is
   a) p-type   b) n-type   c) Both (a) and (b)   d) None of these

146. If n_E and n_H represent the number of free electrons and holes respectively in a semiconducting material, then for n-type semiconducting material
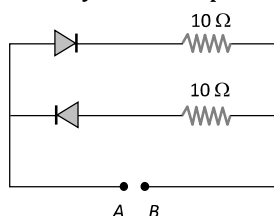   a) $n_E << n_H$ b) $n_E >> n_H$ c) $n_E = n_H$ d) $n_E = n_H = 0$

147. A $2V$ battery is connected across the points A and B as shown in the figure given below. Assuming that the resistance of each diode is zero in forward bias and infinity in reverse bias, the current supplied by the battery when its positive terminal is connected to A is

   a) $0.2\ A$ b) $0.4\ A$ c) Zero   d) $0.1\ A$

148. In a diode, when there is a saturation current, the plate resistance will be
   a) Data insufficient   b) Zero   c) Some finite quantity   d) Infinite quantity

149. The mutual characteristic curves of a triode are as shown in figure. The cut off voltage for the triode is
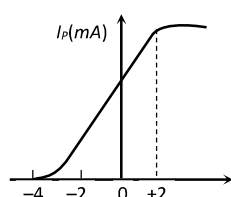
   a) $0\ V$ b) $2\ V$ c) $-4\ V$ d) $6\ V$

150. The output current versus time curve of a rectifier is shown in the figure. The average value of the output current in this case is
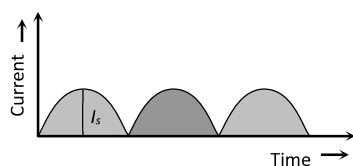
   a) 0 b) i_0/π c) $2i_0/\pi$ d) i_0

151. In an experiment, the saturation in the plate current in a diode is observed at $240V$. But a student still wants to increase the plate current. It can be done, if
   a) The plate voltage is increased further   b) The plate voltage is decreased

c) The filament current is decreased   d) The filament current is increased

152. In the figure, potential difference between A and B is
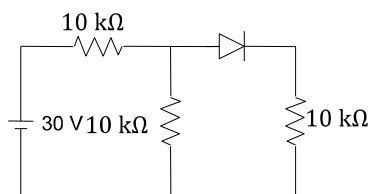
  a) Zero   b) 5 V   c) 10 V   d) 15 V

153. Three amplifier stages each with a gain of 10 are cascaded. The overall gain is

  a) 10   b) 30   c) 1000   d) 100

154. On increasing the reverse bias to a large value in a $p\text{-}n$ junction, diode current

  a) Increases slowly   b) Remains fixed   c) Suddenly increases   d) Decreases slowly

155. The energy band gap is maximum in

  a) Metals   b) Superconductors   c) Insulators   d) Semiconductors

156. The coordination number of Cu is

  a) 1   b) 6   c) 8   d) 12

157. A semiconductor dopped with a donor impurity is

  a) P-type   b) N-type   c) NPN type   d) PNP type

158. The grid in a triode valve is used

  a) To increases the thermionic emission   b) To control the plate to cathode current

  c) To reduce the inter-electrode capacity   d) To keep cathode at constant potential

159. The minimum potential difference between the base and emitter required to switch a silicon transistor 'ON' is approximately

  a) 1 V   b) 3 V   c) 5 V   d) 4.2 V

160. Assuming the diodes to be of silicon with forward resistance zero, the current I in the following circuit is
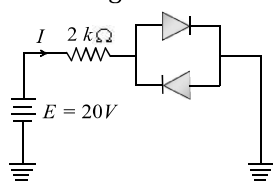
  a) 0   b) $9.65\ mA$ c) $10\ mA$ d) $10.36\ mA$

161. The emitter-base junction of a transistor is ………….. biased while the collector-base junction is ………….. biased.

  a) Forward, forward   b) Forward, reverse   c) Reverse, forward   d) Reverse, reverse

162. Name of a $p\text{-}n$ junction, which can be used as the regulator, is

  a) Zener diode   b) Tunnel diode   c) Gunn diode   d) None of these

163. In a triclinic crystal system

  a) $a \neq b \neq c, \alpha \neq \beta \neq \gamma$ b) $a = b = c, \alpha \neq \beta \neq \gamma$ c) $a \neq b \neq c, \alpha \neq \beta = \gamma$ d) $a = b \neq c, \alpha = \beta = \gamma$

164. The junction diode in the following circuit requires a minimum current of 1mA to be above the knee point (0.7 V) of its $I - V$ characteristic curve. The voltage across the junction diode is independent of current above the knee point, if $V_B = 4V$, then the maximum value of R so that the voltage is above knee point will be
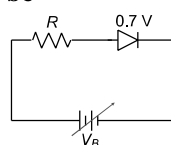
  a) 3.3 kΩ   b) 4.0 kΩ   c) 4.7 kΩ   d) 6.6 kΩ

165. In the following circuit, a voltmeter V is connected across a lamp L. What change would occur in voltmeter reading if the resistance R is reduced in value
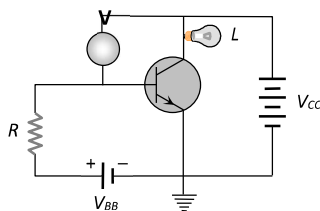
a) Increases   b) Decreases   c) Remains same   d) None of these

166. In extrinsic semiconductors
   a) The conduction band and valence band overlap
   b) The gap between conduction band and valence band is more than 16 eV
   c) The gap between conduction band and valence band is near about 1 eV
   d) The gap between conduction band and valence band will be 100 eV and more

167. The density for a fcc lattice is (A =atomic wt., N =Avogadro's number, a =lattice parameter)
   a) $\dfrac{4A}{Na^3}$ b) $\dfrac{2A}{Na^3}$ c) $\dfrac{A}{Na^3}$ d) $\dfrac{A}{Na^2}$

168. A crystal has bcc structure and its lattice constant is 3.6 Å. What is the atomic radius?
   a) 3.6 Å   b) 1.8 Å   c) 1.27 Å   d) 1.567 Å

169. By increasing the temperature, the specific resistance of a conductor and a semiconductor
   a) Increases for both
   b) Decreases for both
   c) Increases, decreases respectively
   d) Decreases, increases respectively

170. Correct relation for triode is
   a) $\mu = g_m \times r_p$ b) $\mu = \dfrac{g_m}{r_p}$ c) $\mu = 2g_m \times r_p$ d) None of these

171. To a germanium sample, traces of gallium are added as an impurity. The resultant sample would behave like
   a) A conductor
   b) A P-type semiconductor
   c) An N-type semiconductor
   d) An insulator

172. The coordination number of body centred crystal is
   a) 6   b) 8   c) 12   d) 16

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

174. Identify the true statement for OR gate
   a) Output Y will be 1 when input A or B or both are 1
   b) Output Y will be 0 when the either of the inputs A or B is 1
   c) Output Y will be 1 only when both the inputs A and B are 1
   d) Output Y will be 1 only when either of the inputs A and B are 1

175. In the circuit, if the forward voltage drop for the diode is 0.5 V, the current will be
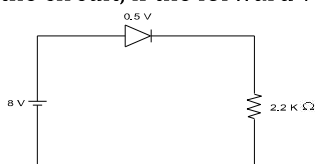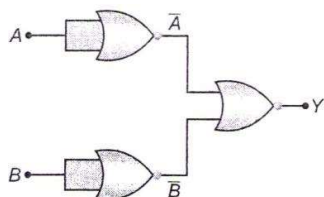

a) 3.4 mA   b) 2 mA   c) 2.5 mA   d) 3 mA

176. The average value of output direct current in a half wave rectifier is
   a) I_0/π b) $I_0/2$ c) $\pi I_0/2$ d) $2I_0/\pi$

177. For given electric voltage signal dc value is
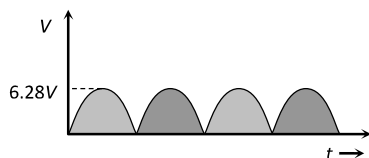
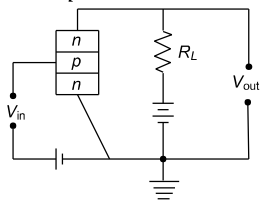   a) 6.28 V b) 3.14 V c) 4 V d) 0 V

178. Identify the operation performed by the circuit given in the figure.

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

179. An $n - p - n -$ transistor circuit is arranged as shown in figure. It is

    a) A common base amplifier circuit   b) A common emitter amplifier circuit
    c) A common collector amplifier circuit   d) Neither of the above

180. For the diode, the characteristics curves are given at different temperatures. The relation between the temperatures is
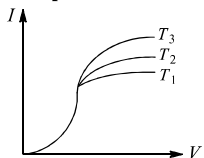
    a) $T_1 = T_2 = T_3$ b) $T_1 < T_2 < T_3$ c) $T_1 \geq T_2 \geq T_3$ d) None of these

181. Identify the system of crystal structure, if $a = b \neq c$ $\alpha = \beta = 90°$ and $\gamma = 120°$.
    a) Monoclinic   b) Triclinic   c) Hexagonal   d) Rhombohedral

182. If the lattice constant of this semiconductor is decreased, then which of the following is correct?
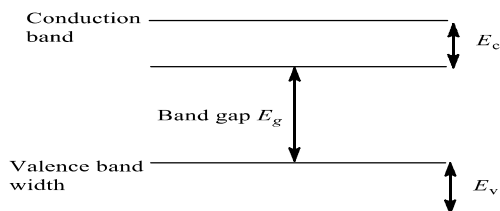
    a) All E_c, E_g, E_v increase   b) E_c and E_v increase, but E_g decreases
    c) E_c and E_v decrease, but E_g increases   d) All E_c, E_g, E_v decreases

183. Energy gap between valence band and conduction band of a semiconductor is
    a) Zero   b) Infinite   c) 1 eV   d) 10 eV

184. In a P-type semiconductor, the acceptor impurity produces an energy level
    a) Just below the valence band   b) Just above the conduction band
    c) Just below the conduction band   d) Just above the valence band

185. The combination of the following gates produces

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

186. The current through an ideal PN-junction shown in the following circuit diagram will be
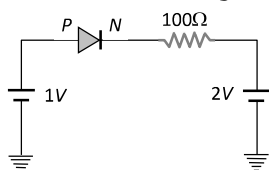
a) Zero b) $1\ mA$ c) $10\ mA$ d) $30\ mA$

187. In the forward bias arrangement of a PN-junction diode
a) The N-end is connected to the positive terminal of the battery
b) The P-end is connected to the positive terminal of the battery
c) The direction of current is from N-end to P-end in the diode
d) The P-end is connected to the negative terminal of battery

188. If the output of a logic gate is 0 when all its inputs are at logic 1, then the gate is either
a) NAND or Ex-NOR b) NOR or OR c) Ex-OR or NOR d) AND or NOR

189. The density for simple cubic lattice is (where A is atomic weight, N is Avogadro's number and a is a lattice parameter)
a) $\dfrac{4A}{Na^3}$ b) $\dfrac{2A}{Na^3}$ c) $\dfrac{A}{Na^3}$ d) $\dfrac{A}{Na^2}$

190. In LED visible light is produced by
a) Gallium phosphide b) Gallium arsenide
c) Germanium phosphide d) Silicon phosphide

191. Current gain of a transistor in common base mode is 0.95. Its value in common emitter mode is
a) 0.95 b) 1.5 c) 19 d) $(19)^{-1}$

192. In the following circuit of PN junction diodes D_1, D_2 and D_3 are ideal then i is
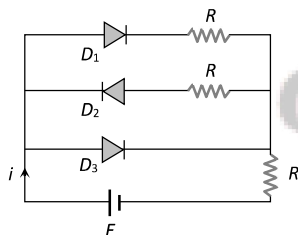
a) E/R b) $E/2R$ c) $2E/3R$ d) Zero

193. Which one of the following statement is not correct in the case of light emitting diodes
a) It is a heavily doped p-n junction
b) It emits light only when it is forward biased
c) It emits light only when it is reverse biased
d) The energy of the light emitted is less than the energy gap of the semiconductor used

194. The ionic bond is absent in
a) NaCl b) CsCl c) LiF d) H_2O

195. Different voltages are applied across a p-n junction and the currents are measured from each value. Which of the following graphs is obtained between voltage and current?

a) b) c) d)
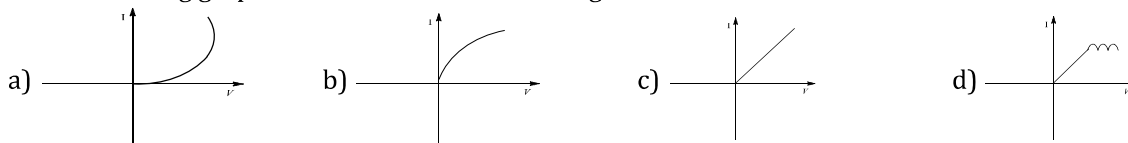
196. In a diode valve, the state of saturation can be obtained easily by
a) High plate voltage and high filament current
b) Low filament current and high plate voltage
c) Low plate voltage and high cathode temperature

d) High filament current and high plate voltage

197. The current gain of a transistor in a common emitter configuration is 40. If the emitter current is 8.2 mA, then base current is

a) 0.02 mA   b) 0.2 mA   c) 2.0 mA   d) 0.4 mA

198. In a P-type semiconductor
   a) Current is mainly carried by holes
   b) Current is mainly carried by electrons
   c) The material is always positively charged
   d) Doping is done by pentavalent material

199. Bonding in a germanium crystal (semi-conductor) is
   a) Metallic   b) Ionic   c) Vander Waal's type   d) Covalent

200. The reverse bias in a junction diode is changed from 8 V to 13 V then the value of the current charges from 40 μA to 60 μA. The resistance of junction diode will be

a) $2 \times 10^5 \Omega$ b) $2.5 \times 10^5 \Omega$ c) $3 \times 10^5 \Omega$ d) $4 \times 10^5 \Omega$

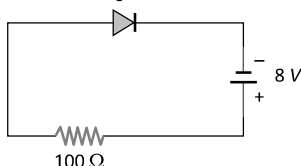201. A source of $8V$ drives the diode in fig. through a current-limiting resistor of $100\ ohm$. Then the magnitude of the slope load line on the V-I characteristics of the diode is

a) 0.01   b) 100   c) 0.08   d) 12.5

202. A truth table is given below. Which of the following has this type of truth table

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

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

203. A transistor has $\beta = 40$. A charge in base current of 100 μA, produces change in collector current

a) 40×100 μA   b) $(100 - 40)$μA   c) $100 + 40$ μA   d) $100 \times /40$ μA

204. In forward bias, the width of potential barrier in a P-N junction diode
   a) Increases   b) Decreases
   c) Remains constant   d) First increases then decreases

205. In a P-N junction diode if P region is heavily doped than n region then the depletion layer is
   a) Greater in P region   b) Greater in N region
   c) Equal in both region   d) No depletion layer is formed in this case

206. The correct relation between n_e and n_h in an intrinsic semiconductor at ordinary temperature is
   a) $n_e > n_h$ b) $n_e < n_h$ c) $n_e = n_h$ d) $n_e = n_h = 0$

207. In the middle of the depletion layer of reverse biased p-n junction, the
   a) Electric field is zero   b) Potential is maximum
   c) Electric field is maximum   d) Potential is zero

208. Boolean expression for OR gate is
   a) $Y = A.B$ b) $Y = \bar{A} + \bar{B}$ c) $Y = A + B$ d) $Y = \bar{A}$

209. A P-type semiconductor has acceptor levels 57 meV above the valence band. The maximum wavelength of light required to create a hole is (Planck's constant $h = 6.6 \times 10^{-34} J$-$s$)

a) 57 Å   b) 57×10^{-3} Å   c) 217100 Å   d) 11.61×10^{-33} Å

210. The output y, when all three inputs are first high and then low, will respectively be
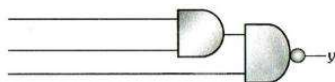

a) 1, 0   b) 1, 1   c) 0, 0   d) 0, 1

211. In an insulator, the forbidden energy gap between the valance band and conduction band is of the order of
    a) $1\ MeV$ b) $0.1\ MeV$ c) $1eV$ d) $5eV$

212. The amplification factor of a triode is 18 and its plate resistance is $8 \times 10^3 \Omega$. A load resistance of $10^4 \Omega$ is connected in the plate circuit. The voltage gain will be
    a) 30   b) 20   c) 10   d) 1

213. The energy band diagrams for three semiconductor samples of silicon are as shown. We can then assert that
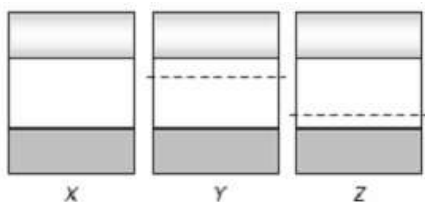
    a) Sample X is undoped while samples Y and Z have been doped with a third group and a fifth group impurity respectively
    b) Sample X is undoped while both samples Y and Z have been doped with a fifth group impurity
    c) Sample X has been doped with equal amounts of third and fifth group impurities while samples Y and Z are undoped
    d) Sample X is undoped while samples Y and Z have been doped with a fifth group and a third group impurity respectively

214. The phase difference between input and output voltages of a CE circuit is
    a) $0°$ b) $90°$ c) $180°$ d) $270°$

215. The input resistance of a common emitter transistor amplifier, if the output resistance is $500\ K\Omega$, the current gain $\alpha = 0.98$ and power gain is 6.0625×10^6, is
    a) $198\ \Omega$ b) 300Ω c) 100Ω d) 400Ω

216. In a semiconducting material the mobilities of electrons and holes are μ_e and μ_h respectively. Which of the following is true
    a) $\mu_e > \mu_h$ b) $\mu_e < \mu_h$ c) $\mu_e = \mu_h$ d) $\mu_e < 0;\ \mu_h > 0$

217. While using triode as an amplifier, we avoid making the grid positive because,
    a) The mutual characteristics is not straight
    b) It affects the amplification factor
    c) It decreases the plate current
    d) Of some different reason

218. This symbol represents

    a) NOT gate   b) OR gate   c) AND gate   d) NOR gate

219. If the slope of the characteristics curve of a vacuum tube diode corresponding to some point is 10^{-3}mAV^{-1}, then the plate resistance of diode and its nature are respectively
    a) 100 kΩ, static   b) 1000 kΩ, dynamic   c) 100 kΩ, dynamic   d) 1000 kΩ, static

220. Why do we prefer indirectly heated cathode to the directly heated cathode?
    a) Equality of potential throughout the cathode
    b) Continuous emission of electrons
    c) Availability of filament material
    d) Due to some other persons

221. The valence of an impurity added to germanium crystal in order to convert it into a P-type semi conductor is
    a) 6   b) 5   c) 4   d) 3

222. The plate characteristic curve of a diode in space charge limited region is as shown in the figure. The slope of curve at point P is $5.0\ mA/V$. The static plate resistance of diode will be

a) 111.1Ω   b) 222.2Ω   c) 333.3Ω   d) 444.4Ω
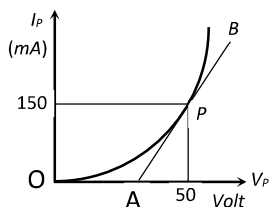
223. C and Si both have same lattice structure, having 4 bonding electrons in each. However, C is insulator where as Si is intrinsic semiconductor. This is because

a) In case of C the valance 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

224. 14×10^{15} electrons reach the anode per second. If the power consumed is 448 $milliwatts$, then the plate (anode) voltage is

a) 150 V b) 200V c) $14 \times 448V$ d) 448/14V

225. 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

226. Which of the following materials in non crystalline

a) Copper   b) Sodium chloride   c) Wood   d) Diamond

227. In good conductors of electricity, the type of bonding the exists is

a) Ionic   b) Vander Waals   c) Covalent   d) Metallic

228. The addition of antimony atoms to a sample of intrinsic germanium transforms it to a material which is

a) Superconductor   b) An insulator

c) N-type semiconductor   d) P-type semiconductor

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

a) 1.25   b) 100   c) 90   d) 10

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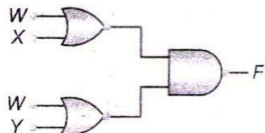
The output F of the circuit is given by

a) $W \cdot (X + Y)$ b) $W \cdot (X \cdot Y)$ c) $W + (X \cdot Y)$ d) $W + (X + Y)$

231. The triode constant is out of the following

a) Plate resistance   b) Amplification factor   c) Mutual conductance   d) All the above

232. A sinusoidal voltage of peak value 200 volt is connected to a diode and resistor R in the circuit figure, so that halfwave rectification occurs. If the forward resistance of the diode is negligible compared to R, the RMS voltage (in volt) across R is approximately
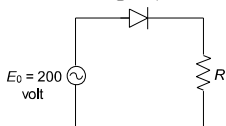
a) 200   b) 100   c) $\dfrac{200}{\sqrt{2}}$ d) 280

233. A junction diode is connected to a 10 V source and $10^3\,\Omega$ rheostate figure. The slope of load line on the characteristic curve of diode will be
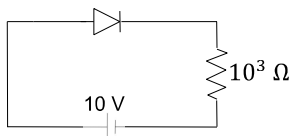
a) $10^{-2}\mathrm{AV}^{-1}$ b) $10^{-3}\mathrm{AV}^{-1}$ c) $10^{-4}\mathrm{AV}^{-1}$ d) $10^{-5}\mathrm{AV}^{-1}$

234. In a *p-n* junction diode acting as a half-wave rectifier, which of the following statement is not true?
    a) The average output voltage over a cycle is non-zero
    b) The drift current depends on biasing
    c) The depletion zone decreases in forward biasing
    d) The diffusion current increases due to forward biasing

235. In breakdown region, a zener diode behaves as a
    a) Constant current source   b) Constant voltage source
    c) Constant resistance source   d) Constant power source

236. If in a triode valve amplification factor is 20 and plate resistance is 10 kΩ, then its mutual conductance is
    a) 2 milli mho   b) 20 milli mho   c) (1/2) milli mho   d) 200 milli mho

237. Mutual conductance of triode is $2\,\mathrm{m\Omega}^{-1}$ and the amplification factor is 50. Its anode is connected with a source of 250 V and a resistance of 25 kΩ. The voltage gain of this amplifier is
    a) 12.5   b) 10   c) 25   d) 50

238. In space charge limited region, the plate current in a diode is $10\,mA$ for plate voltage $150\,V$. If the plate voltage is increased to $600\,V$, then the plate current will be
    a) $10\,mA$ b) $40\,mA$ c) $80\,mA$ d) $160\,mA$

239. In the circuit given below, $V(t)$ is the sinusoidal voltage source, voltage drop $V_{AB}(t)$ across the resistance R is
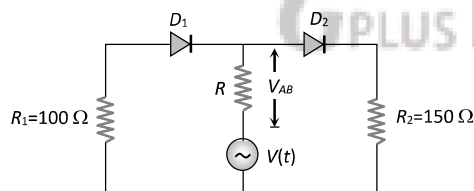
    a) Is half wave rectified
    b) Is full wave rectified
    c) Has the same peak value in the positive and negative half cycles
    d) Has different peak values during positive and negative half cycle

240. In a transistor in common-emitter configuration, the ratio of power gain to voltage gain is
    a) α   b) $\dfrac{\beta}{\alpha}$ c) $\beta \times \beta$ d) β

241. The *i-V* characteristic of a *P-N* junction diode is shown below. The approximate dynamic resistance of the *P-N* junction when a forward bias of $2volt$ is applied\

    a) 1 Ω   b) 0.25 Ω   c) 0.5 Ω   d) 5 Ω
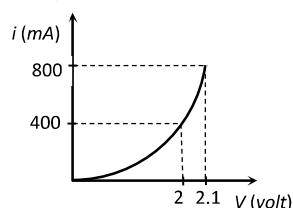
242. In a CE, *n-p-n* transistor circuit, the emitter current is

a) More than the collector current
b) Less than the collector current
c) Less than the base current
d) Equal to the difference of the collector current and the base current

243. To make a *PN* junction conducting
a) The value of forward bias should be more than the barrier potential
b) The value of forward bias should be less than the barrier potential
c) The value of reverse bias should be more than the barrier potential
d) The value of reverse bias should be less than the barrier potential

244. In the depletion region of an unbiased *P-N* junction diode there are
a) Only electrons
b) Only holes
c) Both electrons and holes
d) Only fixed ions

245. The Binary Coded Decimal (BCD) equivalent of 429 is
a) 111001110
b) 010000101001
c) 110101101
d) 0100101001

246. Which of the following is true
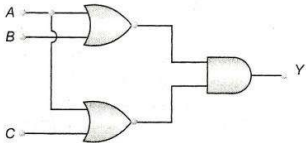a) Common base transistor is commonly used because current gain is maximum
b) Common emitter is commonly used because current gain is maximum
c) Common collector is commonly used because current gain is maximum
d) Common emitter is the least used transistor

247. In a common emitter transistor amplifier, the output resistance is 500 kΩ and the current gain β=49. If the power gain of the amplifier is 5×10^6, the input resistance is
a) 325 Ω
b) 165 Ω
c) 198 Ω
d) 240 Ω

248. The approximate ratio of resistances in the forward and reverse bias of the *PN*-junction diode is
a) $10^2 : 1$
b) $10^{-2} : 1$
c) $1 : 10^{-4}$
d) $1 : 10^4$

249. The output of given logic circuit is

a) $A + B + C$
b) $(A + B) \cdot (A + C)$
c) $A \cdot (B \cdot C)$
d) $A \cdot (B + C)$

250. The contribution in the total current flowing through a semiconductor due to electrons and holes are $\frac{3}{4}$ and $\frac{1}{4}$ respectively. If the drift velocity of electrons is $\frac{5}{2}$ times that of holes at this temperature, then the radio of concentration of electrons and holes is
a) $6 : 5$
b) $5 : 6$
c) $3 : 2$
d) $2 : 3$

251. The team liquid crystal refers to a state that is intermediate between
a) Crystalline solid and amorphous liquid
b) Crystalline solid and vapour
c) Amorphous liquid and its vapour
d) A crystal immersed in a liquid

252. Donor type impurity is found in
a) Trivalent elements
b) Pentavalent elements
c) In both the above
d) None of these

253. Which one of the following is the weakest kind of bonding in solids
a) Ionic
b) Metallic
c) Vander Waals
d) Covalent

254. A *P*-type semiconductor can be obtained by adding
a) Arsenic to pure silicon
b) Gallium to pure silicon
c) Antimony to pure germanium
d) Phosphorous to pure germanium

255. The temperature coefficient of resistance of a conductor is
a) Positive always
b) Negative always
c) Zero
d) Infinite

256. Diode is not considered as linear device because
a) The value of plate current is not directly proportional to the plate voltage

b) When plate voltage is zero, plate current also becomes zero

c) Plate and cathode are not in a straight line

d) None of the above

257. The transfer ratio of a transistor is 50. The input resistance of the transistor when used in the common emitter configuration is $1\ K\Omega$. The peak value for an A.C input voltage of $0.01\ V$ of collector current is

a) $100\ \mu A$ b) $0.01\ mA$ c) $0.05\ mA$ d) $500\ \mu A$

258. Least doped region in a transistor

a) Either emitter or collector   b) Base

c) Emitter   d) Collector

259. In a common emitter transistor, the current gain is 80. What is the change in collector current, when the change in base current is $250\ \mu A$

a) $80 \times 250\ \mu A$ b) $(250 - 80)\mu A$ c) $(250 + 80)\mu A$ d) $250/80\ \mu A$

260. The main cause of zener breakdown is

a) The base semiconductor being germanium

b) Production of electron-hole pairs due to thermal excitation

c) Low doping

d) High doping

261. Which of the following is not equal to 1 in Boolean algebra?

a) $\overline{A \cdot \overline{A}}$ b) $A \cdot \overline{A}$ c) $A + \overline{A}$ d) $A + 1$

262. A potential barrier of $0.50\ V$ exists across a P-N junction. If the depletion region is $5.0 \times 10^{-7}\ m$ wide, the intensity of the electric field in this region is

a) $1.0 \times 10^6 V/m$ b) $1.0 \times 10^5 V/m$ c) $2.0 \times 10^5 V/m$ d) $2.0 \times 10^6 V/m$

263. 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) $6000\ \text{Å}$ b) $4000\ nm$ c) $6000\ nm$ d) $4000\ \text{Å}$

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

265. Why is there sudden increase in current in zener diode?

a) Due to rupture of bonds

b) Resistance of depletion layer becomes less

c) Due to high doping

d) None of the above

266. The output form of a full wave rectifier is

a) An AC voltage   b) A DC voltage

c) Zero   d) A pulsating unidirectional voltage

267. The impurity atom added to germanium to make it N-type semiconductor is

a) Arsenic   b) Iridium   c) Aluminium   d) Iodine

268. If β, R_L and r are the ac current gain, load resistance and the input resistance of a transistor respectively in CE configuration, the voltage and the power gains respectively are

a) $\beta \frac{R_L}{r}$ and $\beta^2 \frac{R_L}{r}$ b) $\beta \frac{r}{R_L}$ and $\beta^2 \frac{r}{R_L}$ c) $\beta \frac{R_L}{r}$ and $\beta \left(\frac{R_L}{r}\right)^2$ d) $\beta \frac{r}{R_L}$ and $\beta \left(\frac{r}{R_L}\right)^2$

269. In a triode valve, the plate resistance is $10000\ \Omega$ and the anode load resistance is $30000\ \Omega$. If the amplification factor is 36, then the voltage gain is

a) 9   b) 27   c) 36   d) 108

270. A diode is connected to 220 V $(rms)ac$ in series with a capacitor as shown in figure. The voltage across the capacitor is
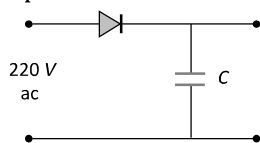
    a) 220 V b) 110 V c) 311.1 V d) $\dfrac{220}{\sqrt{2}} V$

271. What is the current through an ideal PN-junction diode shown in figure below
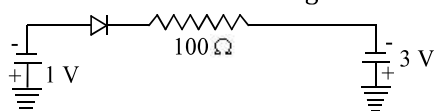
    a) Zero   b) 10 mA c) 20 mA d) 50 mA

272. A semiconductor device is connected in a series circuit with a battery and a resistance. A current is found to pass through the circuit. If the polarity of the battery is revered, the current drops almost to zero. The device may be

    a) A p-type semiconductor   b) An n-type semiconductor

   c) A $p - n$ junction   d) An intrinsic semiconductor

273. If the amplification factor of a triode (μ) is 22 and its plate resistance is 6600 ohm, then the mutual conductance of this valve is mho is

    a) $\dfrac{1}{300}$ b) 25×10^{-2} c) 2.5×10^{-2} d) 0.25×10^{-2}

274. In a common-emitter configuration of a transistor, the base current $I_b = 2\mu A$, $\beta = 0.9$ then $I_c = ?$

    a) 3.0 μA b) 2.25 μA c) 4.9 μA d) 1.8 μA

275. The symbolic representation of four logic gates are given below
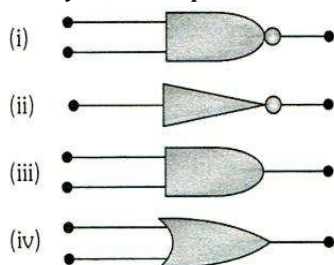
    The logic symbols for OR, NOT and NAND gates are respectively

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

276. The charge on a hole is equal to the charge of

    a) Zero   b) Proton   c) Neutron   d) Electron

277. GaAs is

    a) Element semiconductor   b) Alloy semiconductor

    c) Bad conductor   d) Metallic semiconductor

278. Let n_e and n_h represent the number density of electrons and holes in a semiconductor. Then
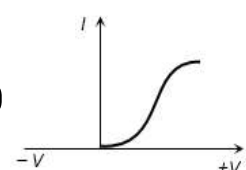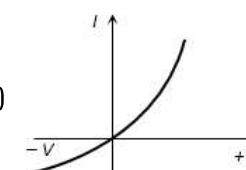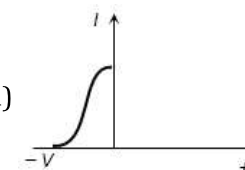
    a) $n_e > n_h$ if the semiconductor is intrinsic

    b) $n_e < n_h$ if the semiconductor is intrinsic

    c) $n_e \neq n_h$ if the semiconductor is intrinsic

    d) $n_e = n_h$ if the semiconductor is intrinsic

279. 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 carriers with temperature

    c) Type of bonding

d) Variation of scattering mechanism with temperature

280. In the study of transistor as an amplifier, if $\alpha = I_c/I_e$ and $\beta = I_c/I_b$, where I_c, I_b and I_e are the collector, base and emitter currents, then

a) $\beta = \dfrac{1-\alpha}{\alpha}$ b) $\beta = \dfrac{\alpha}{1-\alpha}$ c) $\beta = \dfrac{\alpha}{1+\alpha}$ d) $\beta = \dfrac{1+\alpha}{\alpha}$

281. Regarding a semiconductor which one of the following is wrong
   a) There are no free electrons at room temperature
   b) There are no free electrons at 0 K
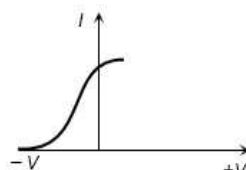   c) The number of free electrons increases with rise of temperature
   d) The charge carriers are electrons and holes

282. The conduction band in a solid is partially filled at 0 K. The solid sample is a
   a) Conductor   b) Semiconductor   c) Insulator   d) None of these

283. Bonds in semiconductor are
   a) Trivalent   b) Covalent   c) Bivalent   d) Monovalent

284. The width of forbidden gap in silicon crystal is $1.1\ eV$. When the crystal is converted in to a N-type semiconductor the distance of Fermi level from conduction band is
   a) Greater than $0.55\ eV$ b) Equal to $0.55\ eV$ c) Lesser than $0.55\ eV$ d) Equal to $1.1\ eV$

285. When n-p-n transistor is used as an amplifier
   a) Electrons move from emitter to base   b) Electrons move from base to emitter
   c) Electrons move from collector to base   d) Holes move from base to emitter

286. In the figure, the input is across the terminals A and C and the output is across B and D. Then the output is
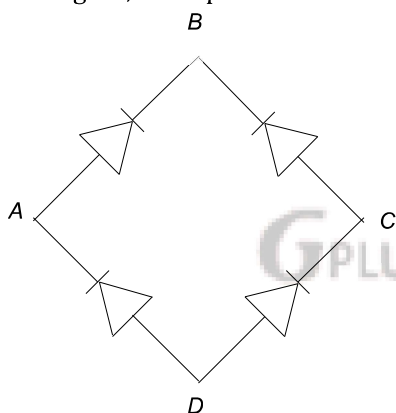
a) Zero   b) Same as the input   c) Full wave rectified   d) Have wave rectified

287. Different voltages are applied across a P-N junction and the currents are measured for each value. Which of the following graphs is obtained between voltage and current

288. The temperature coefficient of a zener mechanism is
   a) Negative   b) Positive   c) Infinity   d) Zero

289. At absolute zero, Si acts as
   a) Non-metal   b) Metal   c) Insulator   d) None of these

290. In the presence of space charge in the diode valve the plate current is 10mA at the plate voltage 50V. Then the plate current at plate voltage 200 V will be
   a) 20 mA   b) 40 mA   c) 80 mA   d) None of these

291. A researcher wants an alarm to sound when the temperature of air in his controlled research chamber rises above $40°C$ or falls below $20°C$. The alarm can be triggered by the output of a

a) AND gate   b) NAND gate   c) NOT gate   d) OR gate

292. The amplification produced by a triode is due to the action of

a) Filament   b) Cathode   c) Grid   d) Plate

293. In NPN transistor, if doping in base region is increased then collector current

a) Increases   b) Decreases   c) Remains same   d) None of these

294. The linear portions of the characteristic curves of a triode valve give the following readings $V_g (volt)$
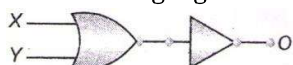
0   -2 -4 -6

$I_p (mA)$ for $V_p = 150\ volts$ 15   12.5   10   7.5

$I_p (mA)$ for $V_p = 120\ volts$ 10   7.5   5   2.5

The plate resistance is

a) $2000\ ohms$ b) $4000\ ohms$ c) $8000\ ohms$ d) $6000\ ohms$

295. The following logic circuit represents

a) NAND gate with output $O = \overline{X} + \overline{Y}$ b) NOR gate with output $O = \overline{X + Y}$

c) NAND gate with output $O = \overline{X \cdot Y}$ d) NOR gate with output $O = \overline{X} \cdot \overline{Y}$

296. The reverse biasing in a PN junction diode

a) Decreases the potential barrier

b) Increases the potential barrier

c) Increases the number of minority charge carriers

d) Increases the number of majority charge carriers

297. If α and β are the collector emitter short circuit current amplification factor and collector base short circuit current amplification factor respectively of a transistor then α is equal to

a) $\dfrac{1 + β}{β}$ b) $\dfrac{β}{1 - β}$ c) $\dfrac{1 - β}{β}$ d) $\dfrac{β}{1 + β}$

298. The ratio of electron and hole current in a semiconductor is 7/4 and the ratio of drift velocities of electrons and holes is 5/4, then ratio of concentrations of electrons and holes will be

a) 5/7   b) 7/5   c) 25/49   d) 49/75

299. S certain triode shows the following readings

V_p V_g I_p

150V -2V,   5 mA

150V -3.5V,   3.2 mA

195V -3.5V,   5 mA

The amplification factor of the triode is
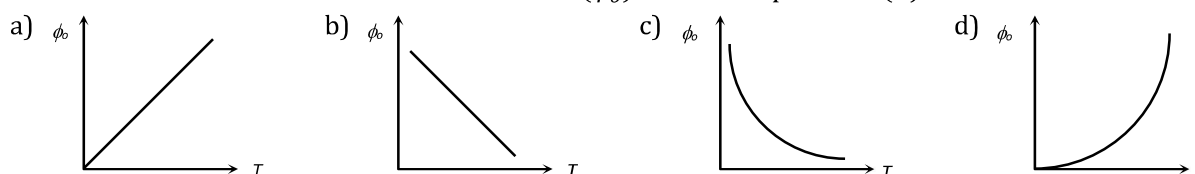
a) 22.5   b) 45   c) 30   d) 60

300. Which logic gate is represented by the following combination of logic gates?
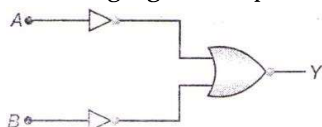
a) OR   b) NOR   c) AND   d) NAND

301. The curve between the work function of a metal (ϕ_o) and its temperature (T) will be

302. For a transistor amplifier in common emitter configuration for load impedance of 1 kΩ ($h_{fe} = 50$ and $h_{oe} = 25\ \mu\ \text{AV}^{-1}$), the current gain is
    a) -5.2 b) -15.7 c) -24.8 d) -48.78

303. For a transistor, in a common emitter arrangement, the alternating current gain β is given by
    a) $\beta = \left(\dfrac{\Delta I_C}{\Delta I_B}\right)_{V_C}$ b) $\beta = \left(\dfrac{\Delta I_B}{\Delta I_C}\right)_{V_C}$ c) $\beta = \left(\dfrac{\Delta I_C}{\Delta I_E}\right)_{V_C}$ d) $\beta = \left(\dfrac{\Delta I_E}{\Delta I_C}\right)_{V_C}$

304. The graph given below represents the *I-V* characteristics of a zener diode. Which part of the characteristics curve is most relevant for its operation as a voltage regulator?
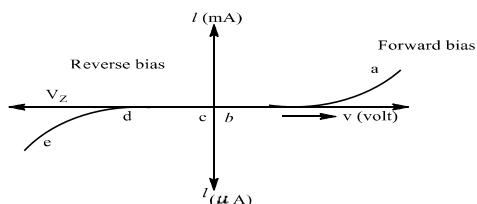
    a) ab b) bc c) cd d) de

305. A donor impurity result in the
    a) Production of n-semiconductor
    b) Production of p-semiconductor
    c) Increase of resistance of the semiconductor
    d) Energy bands just above the filled valency band

306. When n-p-n transistor is used as an amplifier
    a) Electrons move from base to collector   b) Holes move from emitter to base
    c) Electrons move from collector to base   d) Holes move from base to emitter

307. The equivalent decimal number of binary number $(11001.001)_2$ is
    a) 19.100   b) 19.050   c) 25.250   d) 25.125

308. If lattice parameter for a crystalline structure is 3.6 Å, then atomic radius is fcc crystal in Å is
    a) 7.20   b) 1.80   c) 1.27   d) 2.90

309. Diode valve is discovered by
    a) Richardson   b) Dushman   c) Edison   d) Fleming

310. Current gain in common base configuration is less than 1 because
    a) $I_e < I_b$ b) $I_b < I_e$ c) $I_c < I_e$ d) $I_e < I_c$

311. The amplification factor of a triode valve is 15. If the grid voltage is changed by 0.3 *volt* the change in plate voltage in order to keep the plate current constant (in volt) is
    a) 0.02   b) 0.002   c) 4.5   d) 5.0

312. The energy band gap (distance between the conduction band and valence band) in conductor is
    a) Zero   b) 4 Å   c) 10 Å   d) 100 Å

313. A full-wave rectifier circuit with an ac input is shown
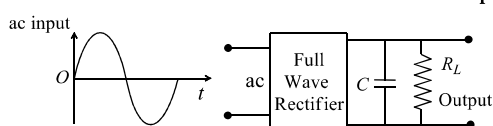
    The output voltage across R_L is represented as
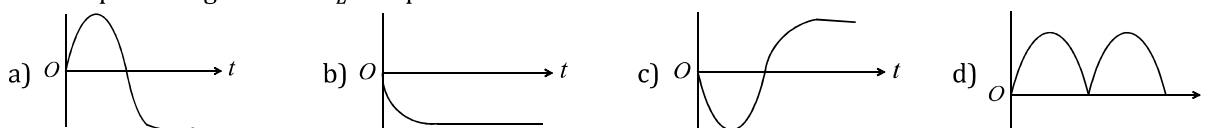
314. Digital circuit can be made by repetitive use of this gate
    a) AND   b) OR   c) NOT   d) NAND

315. In comparison to half wave rectifier, the full wave rectifier gives lower
    a) Efficiency   b) Average dc

c) Average output voltage

d) None of these

316. When forward bias is applied to a P-N junction, then what happens to the potential barrier V_B, and the width of charge depleted region x

a) V_B increases, x decreases

b) V_B decreases, x increases

c) V_B increases, x increases

d) V_B decreases, x decreases

317. The value of ripple factor for full wave rectifier is

a) 40.6%

b) 48.2%

c) 81.2%

d) 121%

318. The following configuration of gate is equivalent to figure.

a) NAND

b) XOR

c) OR

d) None of these

319. In the following circuit find I_1 and I_2

a) 0, 0

b) $5\ mA, 5\ mA$

c) $5\ mA, 0$

d) $0, 5\ mA$

320. The valence band and conduction band of a solid overlap at low temperature, the solid may be

a) A metal

b) A semiconductor

c) An insulator

d) None of these

321. The circuit shown in the figure contains two diodes each with a forward resistance of 50 Ω and with infinite backward resistance. If the battery is 6 V, the current through the 100 Ω resistance (in ampere) is
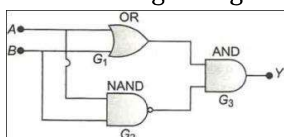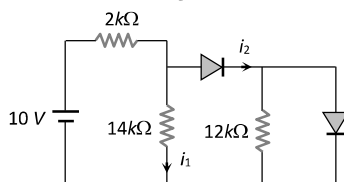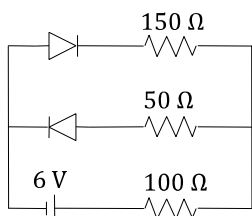

a) Zero

b) 0.02

c) 0.03

d) 0.036

322. The ratio of slopes of anode characteristics and mutual characteristic curves is said to be

a) Mutual conductance

b) Anode resistance

c) Amplification factor

d) Voltage gain

323. In a junction diode, the holes are due to

a) Protons

b) Neutrons

c) Extra electrons

d) Missing of electrons

324. The forbidden energy band gap in conductors, semiconductors and insulators are EG_1, EG_2 and EG_3 respectively. The relation them is

a) $EG_1 = EG_2 = EG_3$

b) $EG_1 < EG_2 < EG_3$

c) $EG_1 > EG_2 > EG_3$

d) $EG_1 < EG_2 > EG_3$

325. Two diodes have resistance 20 Ω and is centretapped with rms secondary voltage from centre tap to each end of secondary 50 V. If external resistance is 980 Ω. What is mean load?

a) 0.05 A

b) 45 mA

c) 0.25 A

d) 25 mA

326. A hole in a P-type semiconductor is

a) An excess electron

b) A missing electron

c) A missing atom

d) A donor level

327. To obtain electrons as majority charge carriers in a semiconductor, the impurity mixed is

a) Monovalent

b) Divalent

c) Trivalent

d) Pentavalent

328. Barrier potential of a p-n junction diode does not depend on

a) Forward bias

b) Doping density

c) Diode design

d) Temperature

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

a) Base

b) Emitter

c) Collector

d) None of these

330. In a reverse biased diode when the applied voltage changes by 1 V, the current is found to change by 0.5 μA. The reverse bias resistance of the diode is
    a) 2×10^5 Ω b) 2×10^6 Ω c) 200 Ω d) 2 Ω

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

a)

b)

c)

d)
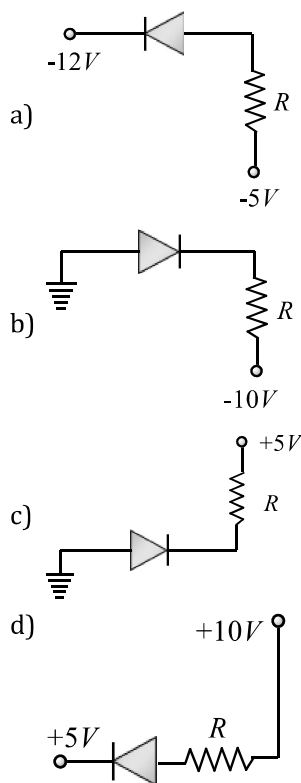
332. The process of adding impurities to the pure semiconductor is called
    a) Drouping b) Dropping c) Doping d) None of these

333. The figure represents variation of triode parameter (μ or r_p or g_m) with the plate current. The correct variation of μ and r_p are given, respectively by the curves
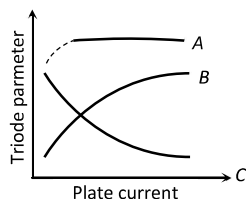
    a) A and B b) B and C c) A and C d) None of the above

334. Due to S.C.R. in vacuum tube
    a) $I_p \rightarrow$ Decrease b) $I_p -$ Increase c) $V_p =$ Increase d) $V_g =$ Increase

335. The Fermi level of an intrinsic semiconductor is pinned at the centre of the band gap. The probability of occupation of the highest electron state in valence band at room temperature, will be
    a) Zero b) Between zero half c) Half d) One

336. Platinum and silicon are heated upto 250°C and after that cooled. In the process of cooling
    a) Resistance of platinum will increase and that of silicon will decrease
    b) Resistance of silicon will increase and that of platinum will decrease
    c) Resistance of both will increase
    d) Resistance of both will decrease

337. Although carbon, silicon and germanium have same lattice structure and four valence electrons each, their band structure leads to the energy gaps as
    a) $E_g(Si) < E_g(Ge) < E_g(C)$ b) $E_g(Si) > E_g(Ge) < E_g(C)$

c) $E_g(Si) < E_g(Ge) > E_g(C)$ d) $E_g(Si) > E_g(Ge) > E_g(C)$

338. The current in a triode at anode potential $100\ V$ and grid potential $-1.2\ V$ is $7.5\ mA$. If grid potential is changed to $-2.2\ V$, the current becomes $5.5\ mA$. the value of trans conductance (g_m) will be

     a) $2\ mili\ mho$ b) $3\ mili\ mho$ c) $4\ mili\ mho$ d) $0.2\ mili\ mho$

339. In the given figure, which of the diodes are forward biased
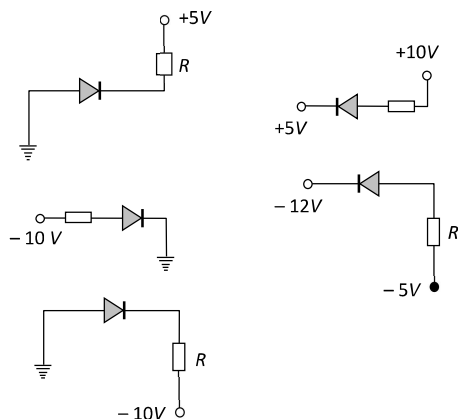
     a) 1, 2, 3   b) 2, 4, 5   c) 1, 3, 4   d) 2, 3, 4

340. Plate current in a diode depends

     a) Only on plate potential

     b) Only on area of plate

     c) Only on temperature of cathode

     d) On plate potential and temperature of cathode

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

     a) $6\ mA$ b) $4.8\ mA$ c) $24\ mA$ d) $8\ mA$

342. Which of the following energy band diagram shows the N-type semiconductor

d)

Valance band (VB)

$1ev$

Conduction band (CB)
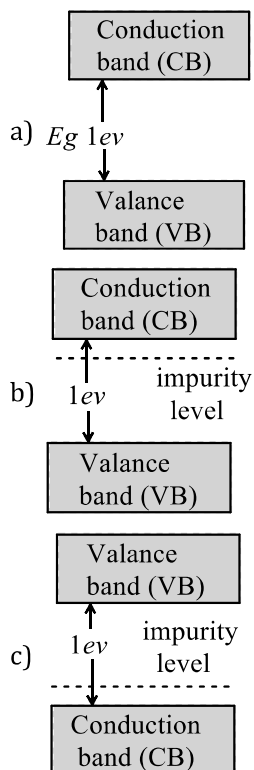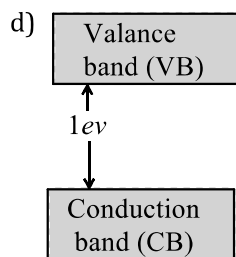
343. The energy gap of silicon is 1.14 eV. The maximum wavelength at which silicon starts energy absorption, will be($h = 6.62 \times 10^{-34}$ Js; $c = 3 \times 10^8 \text{ms}^{-1}$)
    a) 10.888 Å
    b) 108.88 Å
    c) 1088.8 Å
    d) 10888 Å

344. The current in a diode is related to the voltage V by the equation
    a) $I \propto V^{1/2}$
    b) $I \propto V^{3/2}$
    c) $I \propto V^2$
    d) $I \propto V$

345. The mutual characteristic of triode is
    a) I_P vs V_P, V_g=constant
    b) V_P vs I_P, V_g=constant
    c) I_P vs V_g, V_P=constant
    d) I_P vs V_g, V_g=constant

346. n-type semiconductor is
    a) Positively charged
    b) Negatively charged
    c) Neutral
    d) Positive or negative depending upon doping material

347. In a forward biased p-n junction diode, the potential barrier in the depletion region is of the form
    a)
    b)
    c)
    d)

348. If I_1, I_2, I_3 are the lengths of the emitter, base and collector of a transistor then
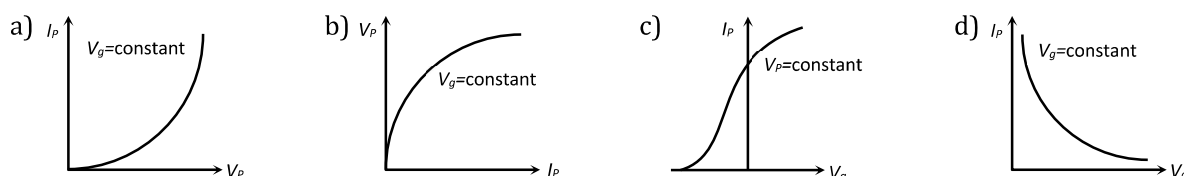   a) $I_1 = I_2 = I_3$
    b) $I_3 < I_2 > I_1$
    c) $I_3 < I_1 < I_2$
    d) $I_3 > I_1 > I_2$

349. In a n-p-n transistor, the collector current is 10mA. If 90% of the electrons emitted reach the collector, then the emitter current will be
    a) 9 mA
    b) 11 mA
    c) 1 mA
    d) 0.1 mA

350. A pure semiconductor behaves slightly as a conductor at
    a) Room temperature
    b) Low temperature
    c) High temperature
    d) Both (b) and (c)

351. A silicon specimen is made into a p-type semiconductor by doping, on an average, one indium atom per 5×10^7 silicon atoms. If the number density of atoms in the silicon specimen is 5×10^{28} atoms m^{-3}, then the number of acceptor atoms in silicon per cubic centimeter will be
    a) 2.5×10^{30} atom cm^{-3}
    b) 2.5×10^{35} atom cm^{-3}
    c) 1×10^{13} atom cm^{-3}
    d) 1×10^{15} atom cm^{-3}

352. When the plate voltage of a triode is 150V, its cut-off voltage is -5 V. On increasing the plate voltage to 200 V, the cut-off voltage can be
    a) -4.5 V
    b) -5.0 V
    c) -2.3 V
    d) -6.66 V

353. In the following common emitter configuration an NPN transistor with current gain $\beta = 100$ is used. The output voltage of the amplifier will be
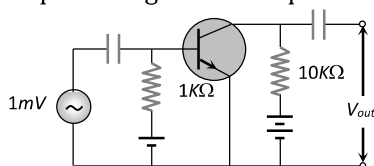
a) $10 \ mV$ b) $0.1 \ V$ c) $1.0 \ V$ d) $10 \ V$

354. A solid which is not transparent to visible light and whose conductivity increases with temperature is formed by
a) Ionic binding
b) Covalent binding
c) van der Waal's binding
d) Metallic binding

355. For the given circuit shown below, to act as full wave rectifier, the AC input should be connected across ………… and ……….. and the DC. output would appear across ……….. and …………. .

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

356. The nature of binding for a crystal with alternate and evenly spaced positive and negative ions is
a) Covalent   b) Metallic   c) Dipolar   d) Ionic

357. The slope of plate characteristic of a vacuum diode is $2 \times 10^{-2} mA/V$. The plate resistance of diode will be
a) $50 \ \Omega$ b) $50 \ k\Omega$ c) $500 \ \Omega$ d) $500 \ k\Omega$

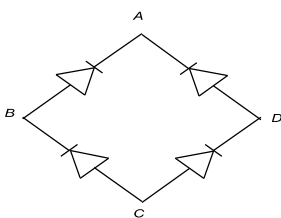358. Doping of a semiconductor (with small traces of impurity atoms) generally changes the resistivity as follows
a) Does not alter
b) Increases
c) Decreases
d) May increase or decrease depending on the dopant

359. A zener diode is used for
a) Rectification   b) Modulation   c) Detection   d) Voltage regulation

360. Radiowaves of constant amplitude can be generated with
a) FET   b) Filter   c) Rectifier   d) Oscillator

361. The peak voltage in the output of a half-wave diode rectifier fed with a sinusoidal signal without filter is $10 \ V$. The dc compound of the output voltage is
a) $10/\sqrt{2} \ V$ b) $10/\pi \ V$ c) $10 \ V$ d) $20/\pi \ V$
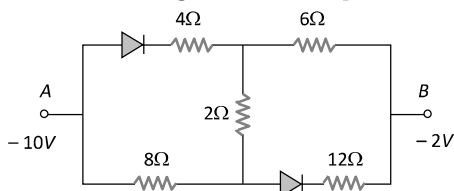
362. For a transistor the parameter $\beta = 99$. The value of the parameter is
a) 0.9 b) 0.99 c) 1 d) 9

363. The reason of current flow in P-N junction in forward bias is
a) Drifting of charge carriers
b) Minority charge carriers
c) Diffusion of charge carriers
d) All of these

364. In the following circuit the equivalent resistance between A and B is

a) $\dfrac{20}{3}\,\Omega$ b) 10 Ω   c) 16 Ω   d) 20 Ω

365. The circuit has two oppositely connected ideal diodes in parallel. What is the current flowing in the circuit?
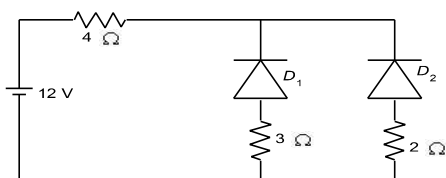
    a) 1.71 A   b) 2.00 A   c) 2.31 A   d) 1.33 A

366. Plate resistance of two triode valves is 2 $k\Omega$ and 4 $k\Omega$, amplification factor of each of the valves is 40. The ratio of voltage amplification, when used with 4 $k\Omega$ load resistance, will be

    a) 10   b) 4/3   c) 3/4   d) 16/3

367. Name the gate, which represents the Boolean expression $Y = \overline{A \cdot B}$

    a) NAND   b) AND   c) NOT   d) NOR

368. A change of 0.8 mA in the anode current of a triode occurs when the anode potential is changed by 10 V. If $\mu = 8$ for the triode, then what change in the grid voltage would be required to produce a change of 4 mA in the anode current

    a) 6.25 V b) 0.16 V c) 15.2 V d) None of these

369. What makes the crystalline solids have a sharp melting point?

    a) Anisotropic nature

    b) Long range order of the constituent atoms/ ions/molecules

    c) Equal strength of all the interatomic bonds

    d) None of the above

370. Which one of the following statements is not correct

    a) A diode does not obey Ohm's law

    b) A PN junction diode symbol shows an arrow identifying the direction of current (forward) flow

    c) An ideal diode is an open switch

    d) An ideal diode is an ideal one way conductor

371. The length of germanium rod is 0.928 cm and its area of cross-section is 1 mm^2. If for germanium $n_i = 2.5 \times 10^{19}$ m^{-3}, $\mu_h = 0.19$ m^{2}V^{-1}s^{-1}, $\mu_e = 0.39$ m^{2}V^{-1}s^{-1}

    a) 2.5 kΩ   b) 4.0 kΩ   c) 5.0 kΩ   d) 10.0 kΩ

372. Which of the following is an amorphous solid

    a) Glass   b) Diamond   c) Salt   d) Sugar

373. Symbolic representation of photodiode is

374. Choose the correct statement

    a) When we heat a semiconductor its resistance increases

    b) When we heat a semiconductor its resistance decreases

    c) When we cool a semiconductor to 0 K then it becomes super conductor

    d) Resistance of a semiconductor is independent of temperature

375. The current gain of a common base transistor circuit is 0.96. On changing the emitter current by 10.0 mA, the change in the base current will be

    a) 9.6 mA   b) 0.4 mA   c) 19.6 mA   d) 24 mA

376. 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

377. The charge carries in a p-type semiconductor are

a) Electrons only

b) Holes only

c) Holes in larger numbers and electrons in smaller numbers

d) Holes and electrons in equal numbers

378. A gate in which all the inputs must be low to get a high output is called

a) A NAND gate   b) An inverter   c) A NOR gate   d) An AND gate

379. Suitable impurities are added to a semiconductor depending on its use. This is done to

a) Increase its life   b) Enable it to withstand high voltage

c) Increase its electrical conductivity   d) Increase its electrical resistivity

380. Output Y is given by
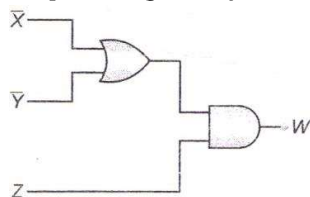
a) $(\overline{X} \cdot \overline{Y}) \cdot Z$ b) $(X + Y)\,Z$ c) $(X + Y)\,\overline{Z}$ d) $\overline{X} \cdot \overline{Y} + \overline{Z}$

381. A full wave rectifier circuit along with the input and output voltages is shown in the figure
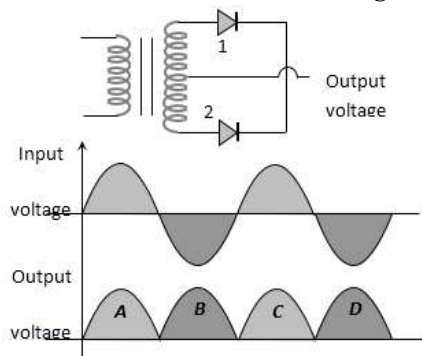
The contribution to output voltage from diode -2 is

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

382. Select the correct statement

a) In a full wave rectifier, two diodes work alternately

b) In a full wave rectifier, two diodes work simultaneously

c) The efficiency of full wave and half wave rectifiers is same

d) The full wave rectifier is bi-directional

383. In a common-emitter amplifier, the load resistance of the output circuit is 1000 times the resistance of the input circuit. If $\alpha = 0.98$, then voltage gain is

a) 49×10^3 b) 2.5×10^2 c) 1.5×10^2 d) 4.9

384. The manifestation of band structure in solids is due to decreases the majority charge carries

a) Heisenberg's uncertainty principle

b) Pauli's exclusion principle

c) Bohr's correspondence principle

d) Boltzmann's law

385. Frequency of given AC signal is 50 Hz. When it is connected to a half-wave rectifier, the number of output pulses given by rectifier within 1 s is

a) 50   b) 100   c) 25   d) 150

386. What is the number of code combination in a 4 bit byte?

a) 256   b) 4   c) 16   d) 32

387. No bias is applied to a P-N junction, then the current

a) Is zero because the number of charge carriers flowing on both sides is same

b) Is zero because the charge carriers do not move
c) Is non-zero
d) None of these

388. A crystal diode is a
a) Non-linear device   b) Amplifying device   c) Linear device   d) Fluctuating device

389. Coating of strontium oxide on tungsten cathode in a valve is good for thermionic emission because
a) Work function decreases
b) Work function increases
c) Conductivity of cathode increases
d) Cathode can be heated to high temperature

390. In a triode, $g_m = 2 \times 10^{-3}$ ohm^{-1}; $\mu = 42$, resistance load, $R = 50$ kΩ. The voltage amplification obtained from this triode will be
a) 30.42   b) 29.57   c) 28.18   d) 27.15

391. On adjusting the P-N junction diode is forward biased
a) Depletion layer increases   b) Resistance increases
c) Both decreases   d) None of these

392. In P-type semiconductor, there is
a) An excess of one electron   b) Absence of one electron
c) A missing atom   d) A donor level

393. In the following circuit, the current flowing through 1 kΩ resistor is

a) Zero   b) 5 mA   c) 10 mA   d) 15 mA

394. Serious draw back of the semiconductor device is
a) They cannot be used with high voltage   b) They pollute the environment
c) They are costly   d) They do not last for long time

395. Based on the energy band description, a solid can be classified as a semiconductor if the energy gap between the valence band and conduction band is
a) $3eV < E_g < 6\ eV$ b) $E_g > 6\ eV$ c) $E_g < 3\ eV$ d) $E_g = 0eV$

396. The nearest distance between two atoms in case of a bcc lattice is equal to
a) $\dfrac{a\sqrt{2}}{3}$ b) $\dfrac{a\sqrt{3}}{2}$ c) $a\sqrt{3}$ d) $\dfrac{a}{\sqrt{2}}$

397. The value of current in a triode valve is given by $I_p = 0.004\left(V_p + 10V_g\right)^{3/2}$ mA . When plate potential and grid potential are 120 V and $-2V$ respectively, then the value of mutual conductance will be
a) 600 mho   b) 60 mho   c) 6 mho   d) 6×10^{-4} mho

398. The current gain of a transistor in common emitter mode is 49. The change in collector current and emitter current corresponding to the change in base current by 5.0 μA are
a) $\Delta i_C = 245\ \mu$A, $\Delta i_E = 250\ \mu$A   b) $\Delta i_C = 252\ \mu$A, $\Delta i_E = 145\ \mu$A
c) $\Delta i_C = 125\ \mu$A, $\Delta i_E = 250\ \mu$A   d) $\Delta i_C = 252\ \mu$A, $\Delta i_E = 230\ \mu$A

399. In which of the following ionic bond is present
a) $NaCl$ b) Ar c) Si d) Ge

400. In a common base amplifier, the phase difference between the input signal voltage and output voltage is
a) $\dfrac{\pi}{4}$ b) π c) Zero   d) $\dfrac{\pi}{2}$

401. In the case of constants α and β of a transistor
a) $\alpha = \beta$ b) $\beta < 1, \alpha > 1$ c) $\alpha\beta = 1$ d) $\beta > 1, \alpha < 1$

402. Following is the relation between current and charge $I = AT^2 e^{q/V_L}$, then value of V_L will be

a) $\dfrac{V}{kt}$ b) $\dfrac{kV}{T}$ c) $\dfrac{kT}{V}$ d) $\dfrac{VT}{k}$

403. When boron is added as an impurity to silicon, the resulting material is
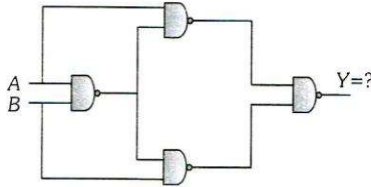
a) n-type semiconductor b) n-type conductor

c) p-type conductor d) p-type semiconductor

404. The diode shown in the circuit is a silicon diode. The potential difference between the points A and B will be
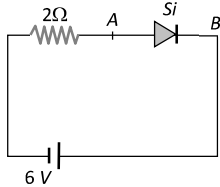
a) $6\ V$ b) $0.6\ V$ c) $0.7\ V$ d) $0\ V$

405. Select the outputs Y of the combination of gates shown below for inputs $A = 1, B = 0;\ A = 1, B = 1$ and $A = 0, B = 0$ respectively

a) $(0\ 1\ 1)$ b) $(0\ 0\ 1)$ c) $(1\ 0\ 0)$ d) $(1\ 1\ 1)$

406. The truth table for the following logic circuit is
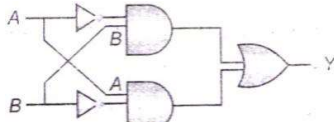
a)
A	B	Y
0	0	0
0	1	1
1	0	1
1	1	0

b)
A	B	Y
0	0	0
0	1	1
1	0	1
1	1	1

c)
A	B	Y
0	0	1
0	1	0
1	0	1
1	1	0

d)
A	B	Y
0	0	1
0	1	1
1	0	0
1	1	1

407. The PN junction diode is used as

a) An amplifier b) A rectifier c) An oscillator d) A modulator

408. The typical ionisation energy of a donar in silicon is

a) 10.0 eV b) 1.0 eV c) 0.1 eV d) 0.001 eV

409. In the diagram, the input is across the terminals A and C and the output is across the terminals B and D, then the output is
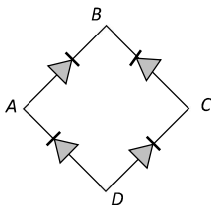
a) Zero b) Same as input c) Full wave rectifier d) Half wave rectifier

410. Which circuit will not show current in ammeter

a)

b)

c)

d)
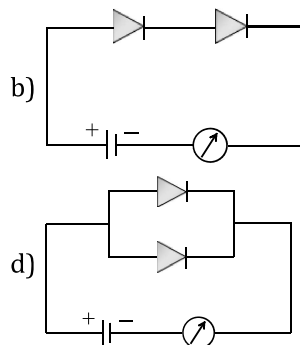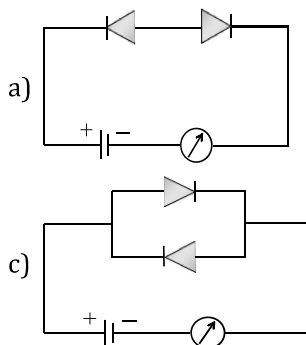
411. A full wave rectifier circuit along with the input and output are shown in the figure, the contribution from the diode I is (are)
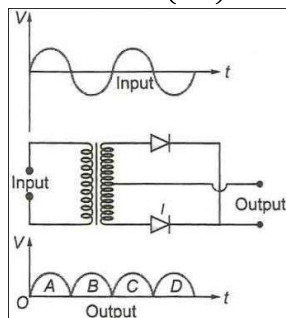
a) C b) A, C c) B, D d) A, B, C, D

412. The ratio of thermionic currents is (I/I_0) for a metal when the temperature is slowly increased from T_0 to T as shown in figure. (I and I_0 are currents at T and respectively). Then which one is correct
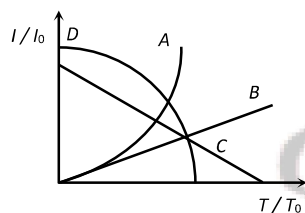
a) A b) B c) C d) D

413. A transistor is used as an amplifier in CB mode with a load resistance of 5 k Ω. The current gain of amplifier is 0.98 and the input resistance is 70 Ω, the voltage gain and power gain respectively are

a) $70, 68.6$ b) $80, 75.6$ c) $60, 66.6$ d) $90, 96.6$

414. The current gain α of a transistor in common base mode is 0.995. Its gain β in the common emitter mode is

a) 200   b) 99   c) 0.995   d) None of these

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

a)

b)

c)   d)
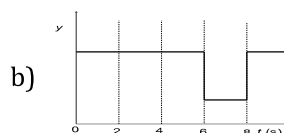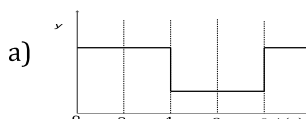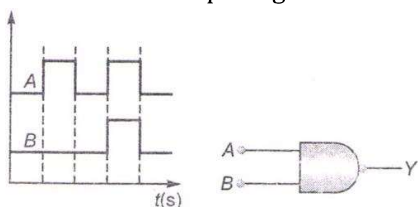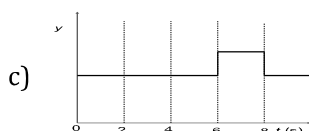
416. What is the value of $A - \bar{A}$ in Boolean algebra?
    a) Zero   b) 1 (one)   c) A d) $\bar{A}$

417. In an NPN transistor the collector current is 24 mA. If 80% of electrons reach collector its base current in mA is
    a) 36   b) 26   c) 16   d) 6

418. The voltage gain of a triode depends upon
    a) Filament voltage   b) Plate voltage   c) Plate resistance   d) Plate current

419. Of the following which relation is true?
    a) $\beta > \alpha$ b) $\alpha > \beta$ c) $\alpha\beta = 1$ d) $\alpha = \beta$

420. In case of a semiconductor, which of the following statement is wrong
    a) Doping increases conductivity
    b) Temperature coefficient of resistance is negative
    c) Resistivity is in between that of a conductor and insulator
    d) At absolute zero temperature, it behaves like a conductor

421. Which of the following logic gate is an universal gate
    a) OR   b) NOT   c) AND   d) NOR

422. Potassium has a bcc structure with nearest neighbor distance 4.525 Å. Its molecular weight is 39. Its density in kg/m^3 is
    a) 900   b) 494   c) 602   d) 802

423. If n_e and n_h are the number of electrons and holes in a semiconductor heavily doped with phosphorus, then
    a) $n_e >> n_h$ b) $n_e << n_h$ c) $n_e \le n_h$ d) $n_e = n_h$

424. In a triode amplifier, $\mu = 25, r_p = 40$ kilo ohm and load resistance $R_L = 10$ kilo ohm. If the input signal voltage is 0.5 volt, then output signal voltage will be
    a) $1.25\ volt$ b) $5\ volt$ c) $2.5\ volt$ d) $10\ volt$

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

    a)   b)   c)   d)

426. The depletion layer of a p-n junction
    a) Is of constant width irrespective of the bias
    b) Acts like an insulating zone under reverse bias
    c) Has a width that increases with an increase in forward bias
    d) Is depleted of ions

427. Reverse bias applied to a p-n junction diode
    a) Lowers the potential barrier
    b) Decreases the majority charge carries
    c) Raises the potential barrier
    d) Change the mass of p-n junction diode

428. Consider an NPN transistor amplifier in common-emitter configuration. The current gain of the transistor is 100. If the collector current changes by 1 mA, what will be the change in emitter current
    a) $1.1\ mA$ b) $1.01\ mA$ c) $0.01\ mA$ d) $10\ mA$

429. In a $n - p - n$ transistor 10^{10} electrons enter the emitter in 10^{-6} s. 4% of the electrons are lost in base. The current transfer ratio will be

a) 0.98   b) 0.97   c) 0.96   d) 0.94

430. The electrical conductivity of an intrinsic semiconductor at 0 K is
     a) Less than that of an insulator   b) Is equal to zero
     c) Is equal to infinity   d) More than that of an insulator

431. Change in temperature
     a) Increases forward resistance
     b) Increases reverse resistance
     c) Affects $V - I$ characteristics of $p - n$ junction
     d) Does not affect $V - I$ characteristic of $p - n$ junction

432. The energy of radiation emitted by LED is
     a) Greater than the band gap of the semiconductor used
     b) Always less than the band gap of the semiconductor used
     c) Always equal to the band gap of the semiconductor used
     d) Equal to or less than the band gap of the semiconductor used

433. In a semiconductor
     a) There are no free electrons at any temperature
     b) The number of free electrons is more than that in a conductor
     c) There are no free electrons at 0 K
     d) None of these

434. In a pure silicon ($n_i = 10^{16}/m^3$) crystal at 300 K, 10^{21} atoms of phosphorus are added per cubic meter.
     The new hole concentration will be
     a) 10^{21} per m^3 b) 10^{19} per m^3 c) 10^{11} per m^3 d) 10^5 per m^3

435. In a n-p-n transistor amplifier, the collector current is 9 mA. If 90% of the electrons from the emitter reach
     the collector, then
     a) $\alpha = 0.9, \beta = 9.0$ b) The base current is 10 mA
     c) The emitter current is 1 mA   d) $\alpha = 9.0, \beta = 0.9$

436. In p-type semiconductors, conduction is 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

437. Which logic gate is represented by following diagram

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

438. The relation between the energy E_f of fermi level, height E_b of potential barrier and work function W_0 is
     a) $E_f = W_0 + E_b$ b) $E_b = W_0 - E_f$ c) $E_b = W_0 + E_f$ d) $W_0 = E_b + E_f$

439. When plate voltage in diode valve is increased from 100 $volt$ to 150 $volt$ then plate current increases from
     7.5 mA to 12 mA. The dynamic plate resistance will be
     a) 10 $k\Omega$ b) 11 $k\Omega$ c) 15 $k\Omega$ d) 11.1 $k\Omega$

440. The collector supply voltage is 6 V and the voltage drop across a resistor of 600 Ω in the collector circuit is
     0.6 V, in a transistor connector in common emitter mode. If the current gain is 20, the base current is
     a) 0.25 mA   b) 0.05 mA   c) 0.12 mA   d) 0.02 mA

441. Electric current is due to drift of electrons in
     a) Metallic conductors   b) Semi-conductors   c) Both (a) and (b)   d) None of these

442. A semiconductor is cooled from $T_1 K$ to $T_2 K$. Its resistance
     a) Will decrease   b) Will increase
     c) Will first decrease and then increase   d) Will not change

443. A p-n junction has acceptor impurity concentration of 10^{17} cm^{-3} in the P side and donor impurity concentration of 10^{16} cm^{-3} in the N side. What is the contact potential at the junction? (kT = thermal energy, intrinsic carrier concentration $n_i = 1.4 \times 10^{10}$ cm^{-3})

a) $\left(\frac{kT}{e}\right) \ln(4 \times 10^{12})$ b) $\left(\frac{kT}{e}\right) \ln(2.5 \times 10^{23})$ c) $\left(\frac{kT}{e}\right) \ln(10^{23})$ d) $\left(\frac{kT}{e}\right) \ln(10^{9})$

444. What controls the conduction of PN Junction

a) Majority carriers   b) Minority carriers   c) Holes   d) Electrons
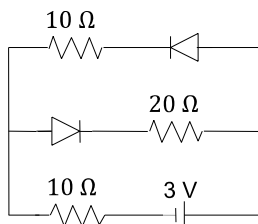
445. The thermionic emission of electron is due to

a) Electromagnetic field   b) Electrostatic field   c) High temperature   d) Photoelectric effect

446. An alternating current can be converted into direct current by a

a) Dynamo   b) Motor   c) Transformer   d) Rectifier

447. In the network show, the current flowing through the battery of negligible internal resistance is

a) 0.10 A   b) 0.15 A   c) 0.20 A   d) 0.30 A

448. 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

449. At ordinary temperatures, the electrical conductivity of semi conductors in $mho/metre$ is in the range

a) 10^{3} to 10^{-4} b) 10^{6} to 10^{9} c) 10^{-6} to 10^{-10} d) 10^{-10} to 10^{-16}

450. In a CE transistor amplifier, the audio signal voltage across the collector resistance of $2k\Omega$ is $2V$. If the base resistance is $1k\Omega$ 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) $10\,mV$

451. Identify the logic gate from the following truth table.

Inputs		Output
A	B	Y
0	0	1
0	1	0
1	0	0
1	1	0

a) NOR gate   b) NOT gate   c) AND gate   d) NAND gate

452. A piece of copper and other of germanium are cooled from the room temperature to 80 K, then

a) Resistance of each will increase
b) Resistance of each will decrease
c) The resistance of copper will increase, while that of germanium will decrease
d) The resistance of copper will decrease, while that of germanium will increase

453. The curve between charge density and distance near P-N junction will be

a)   b)   c)   d)
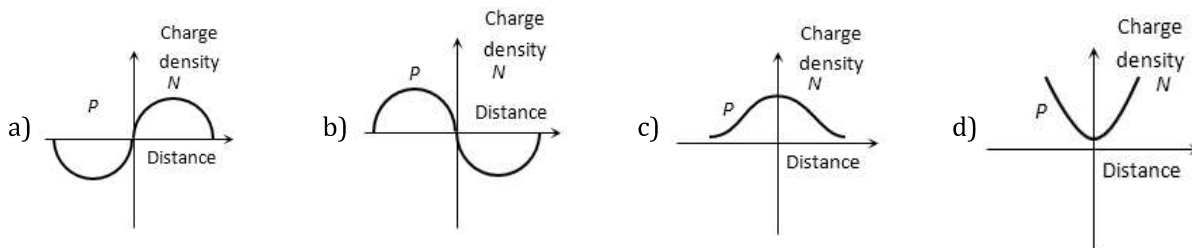
454. In a semiconductor, the concentration of electrons is $8 \times 10^{14}/cm^3$ and that of the holes is $5 \times 10^{12} cm^3$. The semiconductor is
    a) P-type b) N-type c) Intrinsic d) PNP-type

455. Semiconductor is damaged by the strong current due to
    a) Lack of free electron b) Excess of electrons c) Excess of proton d) None of these

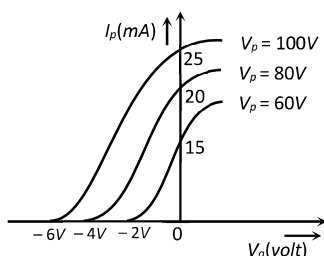456. The variation of anode current in a triode corresponding to a change in grid potential at three different values of the plate potential is shown in the diagram. The mutual conductance of the triode is

    a) $2.5\ m\ mho$ b) $5.0\ m\ mho$ c) $7.5\ m\ mho$ d) $10.0\ m\ mho$

457. Diode is used as a/an
    a) Oscillator b) Amplifier c) Rectifier d) Modulator

458. Sum of the two binary numbers $(100010)_2$ and $(11011)_2$ is
    a) $(111111)_2$ b) $(101111)_2$ c) $(111001)_2$ d) $(111101)_2$

459. What is the net force on an electron placed on an electron placed at the centre of the bcc structure of CsCl?
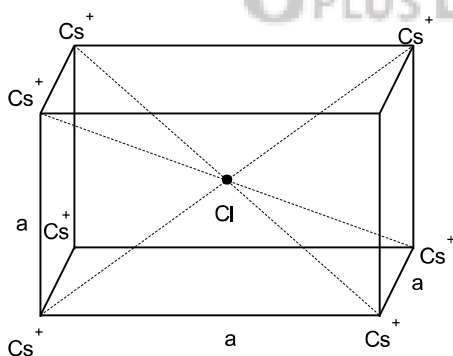
    a) Zero b) $\dfrac{ke^2}{a^2}$ c) $ke^2 a^2$ d) Data is incomplete

460. A logic gate and its truth table are shown below
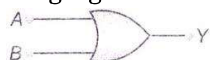
A	B	Y
0	0	0
0	1	1
1	0	1
1	1	1

The gate is
    a) NOR b) AND c) OR d) NOT

461. The circuit diagram shows a logic combination with the states of output *X, Y* and *Z* given for inputs *P, Q, R* and *S* all at state 1. When inputs *P* and *R* change to state 0 with inputs *Q* and *S* still at 1, the states of outputs *X, Y* and *Z* change to

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

462. The binary number 10111 is equivalent to the decimal number

    a) 19   b) 31   c) 23   d) 22

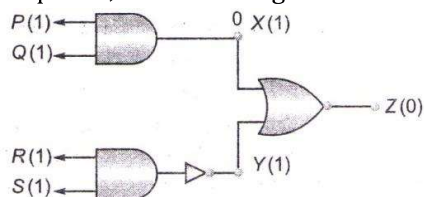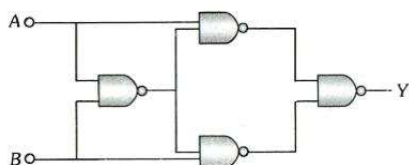463. Sodium has body-centred packing. Distance between two nearest atoms is 3.7 Å. The lattice parameter is

    a) 4.8 Å   b) 4.3 Å   c) 3.9 Å   d) 3.3 Å

464. 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	C
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

465. If the forward voltage in a diode is increased, the width of the depletion region

    a) Increases   b) Decreases   c) Fluctuates   d) No change

466. The n-type semiconductors are obtained, when germanium is doped with

    a) Arsenic   b) Phosphorus   c) Antimony   d) Any one of these

467. The figure shows two NAND gates followed by a NOR gate. The system is equivalent to the following logic gate
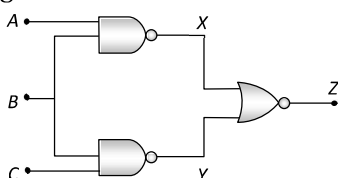
    a) OR   b) AND   c) NAND   d) None of these

468. A $n - p - n$ transistor having a.c. current gain of 50 is to be used to make an amplifier of power gain of 300. What will be the voltage gain of the amplifier

    a) 8.5   b) 6   c) 4   d) 3

469. Electric conduction in semi-conductor takes place due to

    a) Electrons only   b) Holes only

    c) Both electrons and holes   d) None of the above

470. In the figure four plate characteristics of a triode at different grid voltages are shown. The difference between successive grid voltage is 1 V. Which curve will have maximum grid voltage and what is its value
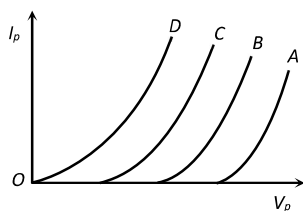
a) $A, V_g = +4\,V$ b) $B, V_g = +4\,V$ c) $A, V_g = 0$ d) $D, V_g = 0$

471. The distance between the body centred atom and a corner atom in sodium ($a = 4.225\,\text{Å}$) is
     a) 3.66 Å   b) 3.17 Å   c) 2.99 Å   d) 2.54 Å

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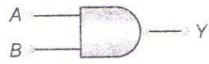   a) $(E_g)_\text{C} > (E_g)_\text{Si}$ b) $(E_g)_\text{C} = (E_g)_\text{Si}$ c) $(E_g)_\text{C} < (E_g)_\text{Ge}$ d) $(E_g)_\text{C}\ (E_g)_\text{Si}$

473. For germanium crystal, the forbidden energy gap in joules is
     a) 1.12×10^{-19} b) 1.76×10^{-19} c) 1.6×10^{-19} d) Zero

474. The ratio of work functions and temperatures of two emitters are 1 : 2, then the ratio of current densities obtained by them will be
     a) 4:1   b) 2:1   c) 1:2   d) 1:4

475. In *P-N* junction, avalanche current flows in circuit when biasing is
     a) Forward   b) Reverse   c) Zero   d) Excess

476. In a *P*-type semi-conductor, germanium is dopped with
     a) Gallium   b) Boron   c) Aluminium   d) All of these

477. Doping of intrinsic semiconductor is done
     a) To neutralize charge carriers
     b) To increase the concentration of majority charge carriers
     c) To make it neutral before disposal
     d) To carry out further purification

478. The gate for which output is high, if at least one input is low?
     a) NAND   b) NOR   c) AND   d) OR

479. The figure shown the symbol of a

     a) AND gate   b) OR gate   c) NOT gate   d) NAND gate

480. The depletion layer in a silicon diode is 1 μm wide and its knee potential is 0.6 V, then the electric field in the depletion layer will be
     a) $0.6\,\text{Vm}^{-1}$ b) $6 \times 10^4\,\text{Vm}^{-1}$ c) $6 \times 10^5\,\text{Vm}^{-1}$ d) Zero

481. In a semiconductor, the forbidden energy gap between the valence band and the conduction band is of the order is
     a) 1 MeV   b) 0.1 MeV   c) 1 eV   d) 5 eV

482. To a germanium crystal equal number of aluminium and indium atoms are added. Then
     a) It remains an intrinsic semiconductor
     b) It becomes a *n*-type semiconductor
     c) It becomes a *p*-type semiconductor
     d) It becomes an insulator

483. In a common base transistor circuit, the current gain is 0.98. On changing emitter current by 5.00 mA, the change in collector current is
     a) 0.196 mA   b) 2.45 mA   c) 4.9 mA   d) 5.1 mA

484. Which one is correct relation for thermionic emission
     a) $J = AT^{1/2}e^{-\phi/kT}$ b) $J = AT^2 e^{-\phi/kT}$ c) $J = AT^{3/2}e^{-\phi/kT}$ d) $J = AT^2 e^{-\phi/2kT}$

485. Let i_e, i_c and i_b represent emitter current, collector current and the base current of a transistor, then
   a) $i_c > i_e$ b) $i_b > i_c$ c) $i_b > i_c$ d) $i_e > i_c$

486. A silicon specimen is made into a p-type semiconductor by dropping, on an average, one indium atom per 5×10^7 silicon atoms. If the number density of atoms in the silicon specimen is 5×10^{28} atoms m^{-3}, then the number of acceptor atoms in silicon per cubic centimeter will be
   a) 2.5×10^{30} atoms cm^{-3}
   b) 2.5×10^{35} atoms cm^{-3}
   c) 1.0×10^{13} atoms cm^{-3}
   d) 1.0×10^{15} atoms cm^{-3}

487. For a thermionic emitter (metallic) if J represents the current density and T is its absolute temperature then the correct curve between $\log_e \frac{J}{T^2}$ and $\frac{1}{T}$ is

a)   b)   c)   d)
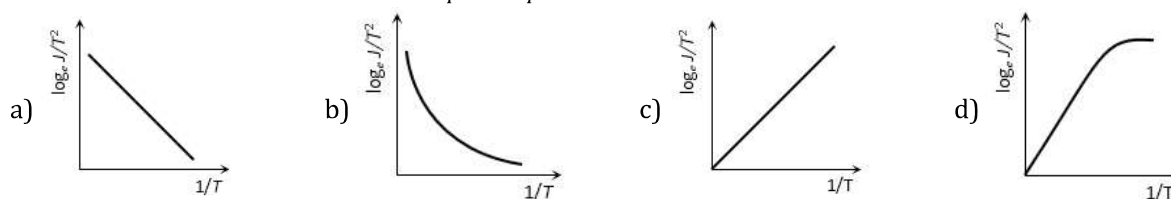
488. Currents flowing in each of the circuits A and B respectively are
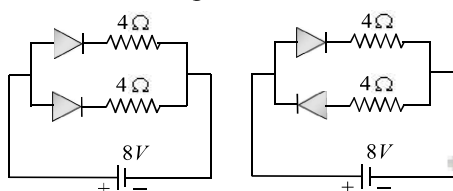
   (Circuit A)   (Circuit B)
   a) 1 A, 2 A   b) 2 A, 1 A   c) 4 A, 2 A   d) 2 A, 4 A

489. Which of the following is not a process involved in fabrication of IC
   a) Polymerization   b) Diffusion   c) Photolithography   d) Metallisation

490. The plate resistance of a triode is $2.5 \times 10^4 \Omega$ and mutual conductance is 2×10^{-3} mho. What will be the value of amplification factor
   a) 50   b) 1.25×10^7 c) 75   d) 2.25×10^7

491. p-type semiconductor are
   a) Positively charged
   b) Produced when boron is added as an impurity
   c) Produced when phosphorus is added as an impurity to silicon
   d) Produced when carbon is added as an impurity to germanium.

492. The temperature of germanium is decreased from room temperature to 100 K, the resistance of germanium
   a) Decreases   b) Increases
   c) Unaffected   d) Depends on external conditions

493. In the given circuit for ideal diode, the current through the battery is
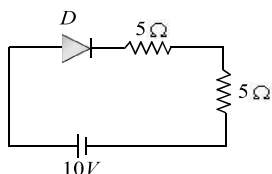
   a) $0.5\ A$ b) $1.5\ A$ c) $1.0\ A$ d) $2\ A$

494. An n-type semiconductor is
   a) Negatively charged
   b) Positively charged

c) Neutral
d) Negatively or positively charged depending upon the amount of impurity

495. The resonance frequency of the tank circuit of an oscillator when $L = \frac{10}{\pi^2} mH$ and $C = 0.04\mu F$ are connected in parallel is
a) $250\ kHz$ b) $25\ kHz$ c) $2.5\ kHz$ d) $25\ MHz$

496. Biaxial crystal among the following is
a) Calcite   b) Quartz   c) Selenite   d) Tourmaline

497. The plate current will be zero in triode, if the negative potential applied on grid is (here μ is amplification factor, R_p is plate resistance, V_p is plate potential)
a) V_p/μ b) μV_p c) $V_p R_p$ d) V_p/R_p

498. The ripple factor in a half wave rectifier is
a) 1.21   b) 0.48   c) 0.6   d) None of these

499. With a change of load resistance of a triode, used as an amplifier, from 50 $kilo\ ohms$ to 100 $kilo\ ohms$, its voltage amplification changes from 25 to 30. Plate resistance of the triode is
a) $25\ k\Omega$ b) $75\ k\Omega$ c) $7.5\ k\Omega$ d) $2.5\ k\Omega$

500. The reverse saturation of p-n diode
a) Depends on doping concentrations
b) Depends on diffusion lengths of carriers
c) Depends on the doping concentrations and diffusion lengths
d) Depends on the doping concentrations, diffusion length and device temperature

501. Application of a forward bias to a p-n junction
a) Increase the number of donors on the n-side
b) Increase the electric field in the depletion zone
c) Increase the potential difference across (the depletion zone)
d) Widens the depletion zone

502. The logic behind 'NOR' gate is that it gives
a) High output when both the inputs are low
b) Low output when both the inputs are low
c) High output when both the inputs are high
d) None of these

503. If A and B are two inputs in AND gate, then AND gate has an output of 1 when the values of A and B are
a) $A = 0, B = 0$ b) $A = 1, B = 1$ c) $A = 1, B = 0$ d) $A = 0, B = 1$

504. A Ge specimen is doped with Al. The concentration of acceptor atoms is $-10^{21}\ atoms/m^3$. Given that the intrinsic concentration of electron hole pairs is $\sim 10^{19}/m^3$, the concentration of electron in the specimen is
a) $10^{17}/m^3$ b) $10^{15}/m^3$ c) $10^4/m^3$ d) $10^2/m^3$

505. A light emitting diode (LED) has a voltage drop of 2 V across it and passes a current of 10 mA. When it operates with 6 V battery through a limiting resistor R, the value of R is
a) 40 kΩ   b) 4 kΩ   c) 200 Ω   d) 400 Ω

506. The inputs and outputs for different time intervals are given below the NAND gate.

Time	Input A	Input B	Output Y
t_1 to t_2	0	1	P
t_2 to t_3	0	0	Q
t_3 to t_4	1	0	R
t_4 to t_5	1	1	S

The values taken by P, Q, R, S are respectively
a) 1, 1, 1, 0   b) 0, 1, 0, 1   c) 0, 1, 0, 0   d) 1, 0, 1, 1

507. The value of amplification factor from the following graph will be
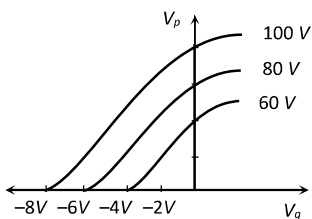
a) 10   b) 50   c) 25   d) 40

508. Which impurity is doped in Si to form N-type semi-conductor
     a) Al b) B c) As d) None of these

509. The energy gap between conduction band and the valence band is of the order of 0.7 eV. Then it is
     a) An insulator   b) A conductor   c) A semiconductor   d) An alloy

510. Which is the wrong statement in following sentences? A device in which P and N-type semiconductors are used is more useful then a vacuum type because
     a) Power is not necessary to heat the filament
     b) It is more stable
     c) Very less heat is produced in it
     d) Its efficiency is high due to a high voltage across the junction

511. A p-n junction in series with a resistance of 5 kΩ is connected across a 50 V DC source. If the forward bias resistance of the junction is 50 Ω, the forward bias current is
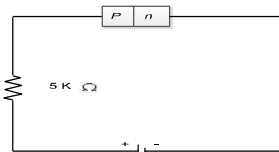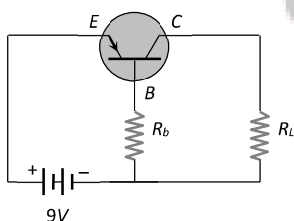

     a) 8.8 mA   b) 1 mA   c) 2 mA   d) 9.9 mA

512. How many NAND gates are required to form an AND gate?
     a) 1   b) 2   c) 3   d) 4

513. In a transistor circuit shown here the base current is 35 μA. The value of the resistor R_b is

     a) 123.5 $k\Omega$ b) 257 $k\Omega$ c) 380.05 $k\Omega$ d) None of these

514. In the following circuits PN-junction diodes D_1, D_2 and D_3 are ideal for the following potentials of A and B. The correct increasing order of resistance between A and B will be
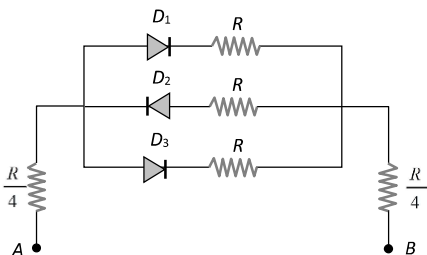
     (i) $-10\ V, -5V$
     (ii) $-5V, -10\ V$
     (ii) $-4V, -12V$
     a) (i) < (ii) < (iii)   b) (iii) < (ii) < (i)   c) (ii) = (iii) < (i)   d) (i) = (iii) < (ii)

515. In a p-n junction diode, a square input signal of 10 V is applied as shown in figure. The output signal across R_L will be

a) ⟍___⟋ 10 V   b) ⟍___⟋ 5 V   c) -5 V ⟍___⟋   d) -10 V ⟍___⟋

516. Suppose an unregulated d.c. input voltage V_I is applied to a Zener diode having breakdown voltage (V_z). Then the breakdown condition for the diode to work as voltage regulator is

   a) $V_I < V_z$ b) $V_I = V_z$ c) $V_I > V_z$ d) $V_I < \sqrt{V_z}$

517. In a *p-n* junction diode not connected to any circuit

    a) The potential is the same everywhere

    b) The *p*-type side has a higher potential than the *n*-type side

    c) There is an electric field at the junction directed from the *n*-type side to *p*-type side

    d) There is an electric field at the junction directed from the *p*-type side to *n*-type side

518. A solid which is not transparent to visible light and whose electrical conductivity increases with temperature is formed by

    a) Ionic bonding   b) Metallic bonding

    c) Covalent bonding   d) Van der waal bonding

519. Two *PN*-junctions can be connected in series by three different methods as shown in the figure. If the potential difference in the junctions in the same, then the correct connections will be
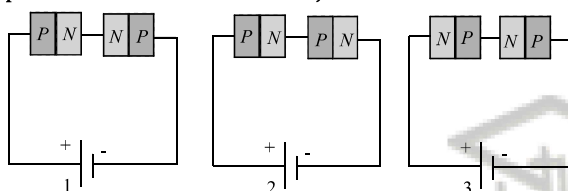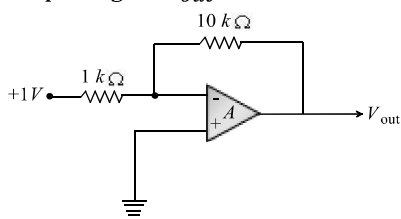

    a) In the circuit (1) and (2)

    b) In the circuit (2) and (3)

    c) In the circuit (1) and (3)

    d) Only in the circuit (1)

520. The output of OR gate is 1

    a) If both inputs are zero   b) If either or both inputs are 1

    c) Only if both input are 1   d) If either input is zero

521. In the circuit shown below, an input of $1V$ is fed into the inverting input of an ideal OP-amplifier. The output signal V_{out} will be

    a) $+10\,V$ b) $-10\,V$ c) $0\,V$ d) Infinity

522. In a common emitter configuration of a transistor, the voltage drop across a 500Ω resistor in the collector circuit is $0.5\,V$ when the collector supply voltage is 0.96, the base current is

    a) $\frac{1}{20}\,\mu A$ b) $\frac{1}{5}\,\mu A$ c) $\frac{1}{20}\,mA$ d) $\frac{1}{24}\,mA$

523. The resistance of a reverse biased *P-N* junction diode is about

    a) $1\,ohm$ b) $10^2\,ohm$ c) $10^3\,ohm$ d) $10^6\,ohm$

524. Copper has face-centred cubic (fcc) lattice with interatomic spacing equal to 2.54 Å. The value of lattice constant for this lattice is

    a) 1.27 Å   b) 5.08 Å   c) 2.54 Å   d) 3.59 Å

525. In BJT, maximum current flows in which of the following?
    a) Emitter region
    b) Base region
    c) Collector region
    d) Equal in all the regions

526. A solid reflects incident light and its electrical conductivity decreases with temperature. The binding in this solid is
    a) Ionic
    b) Covalent
    c) Metallic
    d) Molecular

527. When A is the internal stage gain of an amplifier and β is the feedback ratio, then the amplifier becomes as oscillator if
    a) β is negative and magnitude of β $= A/2$
    b) β is negative and magnitude of β $= 1/A$
    c) β is negative and magnitude of β $= A$
    d) β is positive and magnitude of β $= 1/A$

528. Pick out the statement which is not correct
    a) At a low temperature, the resistance of a semiconductor is very high
    b) Movement of holes is restricted to the valence band only
    c) Width of the depletion region increases as the forward bias voltage increases in case of a N-P junction diode
    d) In a forward bias condition, the diode heavily conducts

529. The correct relation between α and β in a transistor is
    a) $\beta = \dfrac{\alpha}{1-\alpha}$
    b) $\beta = \dfrac{\alpha}{1+\alpha}$
    c) $\beta = \dfrac{1+\alpha}{\alpha}$
    d) $\beta = 1 - \alpha$

530. When the temperature of silicon sample is increased from 27°C to 100°C, the conductivity of silicon will be
    a) Increased
    b) Decreased
    c) Remain same
    d) Zero

531. As shown if 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

532. When a solid with a band gap has a donor level just below its empty energy band, the solid is
    a) An insulator
    b) A conductor
    c) p-type semiconductor
    d) n-type semiconductor

533. The laptop PC's modern electronic watches and calculators use the following for display
    a) Single crystal
    b) Poly crystal
    c) Liquid crystal
    d) Semiconductors

534. Minority carriers in a p-type semiconductor are
    a) Free electrons
    b) Holes
    c) Neither holes nor free electrons
    d) Both holes and free electrons

535. A potential difference of $2V$ is applied between the opposite faces of a Ge crystal plate of area $1\ cm^2$ and thickness $0.5\ mm$. If the concentration of electrons in Ge is $2 \times 10^{19}/m^3$ and mobilities of electrons and holes are $0.36\,\dfrac{m^2}{volt-s}$ and $0.14\,\dfrac{m^2}{volt-s}$ respectively, then the current flowing through the plate will be
    a) $0.25\ A$
    b) $0.45\ A$
    c) $0.56\ A$
    d) $0.64\ A$

536. As n-type and a p-type silicon semiconductor can be obtained by doing pure silicon with
    a) Sodium and magnesium
    b) Phosphorus and boron respectively
    c) Boron and phosphorus respectively
    d) Indium and sodium respectively

537. An intrinsic semiconductor at 0 K temperature behaves like
    a) Conductor
    b) p-type semiconductor

c) n-type semiconductor   d) Insulator

538. The state of the energy gained by valance electrons when the temperature is raised or when electric field is applied in called as

    a) Valance band   b) Conduction band   c) Forbidden band   d) None of these

539. For a transistor amplifier, the voltage gain

    a) Is high at high and low frequencies and constant in the middle frequency range

    b) Is low at high and low frequencies and constant in the middle frequency range

    c) Remains constant for all frequencies

    d) Is high at high frequencies and low at low frequencies and constant in middle frequency range

540. A junction diode has a resistance of 25 Ω when forward biased and 2500 Ω when reverse biased. The current in the diode, for the arrangement shown will be
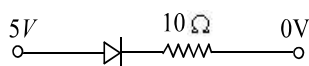
    a) $\dfrac{1}{15}A$ b) $\dfrac{1}{7}A$ c) $\dfrac{1}{25}A$ d) $\dfrac{1}{480}A$

541. In a triode valve

    a) If the grid voltage is zero then plate current will be zero

    b) If the temperature of filament is doubled, then the thermionic current will also be doubled

    c) If the temperature of filament is doubled, then the thermionic current will nearly be four times

    d) At a definite grid voltage the plate current varies with plate voltage according to Ohm's law

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

    a) At a very low temperature, it behaves like an insulator

    b) At high temperature two types of charge carriers will cause conductivity

    c) The charge carriers are electrons and holes in the valence band at higher temperatures

    d) The semiconductor is electrically neutral

543. Which of the following is forward biased?

    a)   b)

                                             d) None of these

    c)
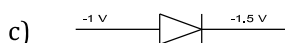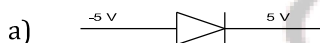
544. The Boolean equation of NOR gate is

    a) $C = A + B$ b) $C = \overline{A + B}$ c) $C = A \cdot B$ d) $C = \overline{A \cdot B}$

545. The plate current i_p in a triode valve is given $i_p = K\left(V_p + \mu V_g\right)^{3/2}$ where i_p is in milliampere and V_p and V_g are in $volt$. If $r_p = 10^4\ ohm$, and $g_m = 5 \times 10^{-3} mho$, then for $i_p = 8\ mA$ and $V_p = 300\ volt$, what is the value of K and grid cut off voltage

    a) $-6V, (30)^{3/2}$ b) $-6V, (1/30)^{3/2}$ c) $+6V, (1/30)^{3/2}$ d) $+6V, (1/30)^{3/2}$

546. The energy gap of silicon is 1.14 eV. At what wavelength the silicon will stop to absorb the photon?

    a) 10877 Å   b) 9888 Å   c) 1087.7 Å   d) 1000 Å

547. A transistor oscillator is

    (i) An amplifier with positive feedback

    (ii) An amplifier with reduced gain

    (iii) The one in which DC supply energy is converted into AC output energy. Then

    a) All (i), (ii) and (iii) are correct   b) (i) and (ii) are correct

    c) (i) and (iii) are correct   d) (ii) and (iii) are correct

548. A PN-junction has a thickness of the order of

    a) $1cm$ b) $1mm$ c) $10^{-6}m$ d) $10^{-12}cm$

549. Atomic packing factor for a face centred cubic cells

a) $\dfrac{\pi}{6}$ b) π c) $\dfrac{\sqrt{3}}{8}\pi$ d) $\dfrac{\sqrt{2}}{6}\pi$

550. For a given plate-voltage, the plate current in a triode is maximum when the potential of
   a) The grid is positive and plate is negative   b) The grid is positive and plate is positive
   c) The grid is zero and plate is positive   d) The grid is negative and plate is positive

551. In a transistor if collector current is 25 mA and base current is 1 mA, then current amplification factor α is
   a) $\dfrac{25}{24}$ b) $\dfrac{24}{25}$ c) $\dfrac{25}{26}$ d) $\dfrac{26}{25}$

552. 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 biased
   (4) Both the emitter-base junction as well as the base collector junction are forward biased
   Which of the following pairs of statements is correct
   a) (4), (1)   b) (1), (2)   c) (2), (3)   d) (3), (4)

553. Which is the name of the gate obtained by the combination shown in figure?
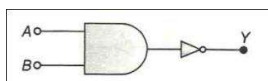
   a) NAND   b) NOR   c) NOT   d) XOR

554. 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 mW. What should be the value of the resistor R, connected in series with the diode for obtaining maximum current?

   a) 1.5 Ω   b) 5 Ω   c) 6.67 Ω   d) 200 Ω
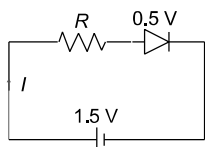
555. Which type of gate the following truth table represents?

Inputs		Output
A	*B*	*Q*
0	0	1
0	1	1
1	0	1
1	1	0

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

556. Current in the circuit will be
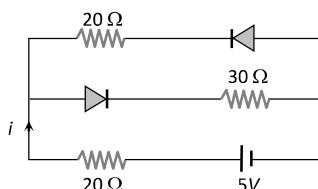
   a) $\dfrac{5}{40}A$ b) $\dfrac{5}{50}A$ c) $\dfrac{5}{10}A$ d) $\dfrac{5}{20}A$

557. What will be the input of A and B for the Boolean expression $\overline{(A + B)} \cdot \overline{(A \cdot B)} = 1$
    a) 0, 0   b) 0, 1   c) 1, 0   d) 1, 1

558. An alternating voltage of 141.4V (rms) is applied to a vacuum diode as shown in the figure. The maximum potential difference across the condenser will be
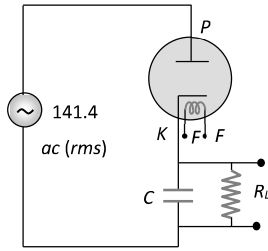
    a) 100 V b) 200 V c) $100\sqrt{2}\ V$ d) $200\sqrt{2}V$

559. What is the current in the circuit shown below
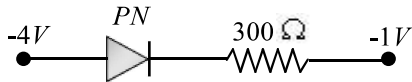
    a) 0 A b) $10^{-2}\ A$ c) 1 A d) 0.10 A

560. The value of D.C. voltage in Half wave rectifier in converting A.C. voltage $V = 100 \sin(314\ t)$ into D.C. is
    a) 100 $volt$ b) 50 $volt$ c) 30.3 $volt$ d) 0

561. The expected energy of the electrons at absolute zero is called
    a) Fermi energy   b) Emission energy   c) Work function   d) Potential energy

562. The time variations of signals are given as in A, B and C. Point out the true statement from the following.
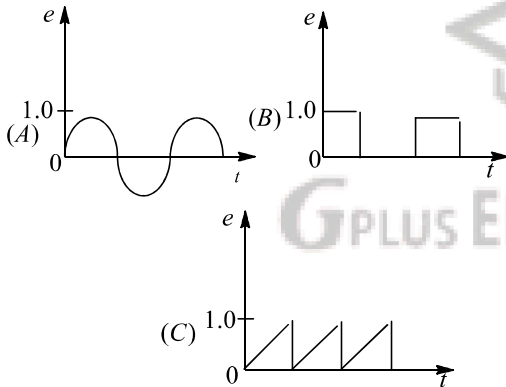
    a) A, B and C are analogue signals
    b) A and B are analogue, but C is digital signal
    c) A and C digital, but B is analogue signal
    d) A and C are analogue but B is digital signal

563. The correct curve between voltage gain $(A,)$ and load resistance (R_L) is
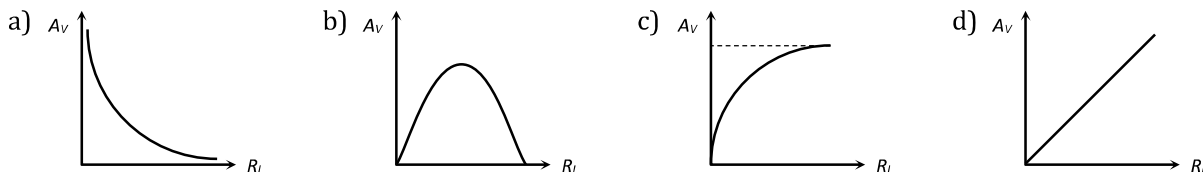
564. A change of 8.0 mA in the emitter current brings a change of 7.9 mA in the collector current. The values of α and β are
    a) 0.99, 90   b) 0.96, 79   c) 0.97, 99   d) 0.99, 79

565. In common emitter amplifier, the current gain is 62. The collector resistance and input resistance are 5 kΩ and 500 Ω respectively. If the input voltage is 0.01 V, the output voltage is
    a) 0.62 V   b) 6.2 V   c) 62 V   d) 620 V

566. Current gain in common emitter configuration is more than 1 becomes

a) $I_c < I_b$ b) $I_c < I_e$ c) $I_c > I_e$ d) $I_e > I_b$

567. For the transistor circuit shown below, if $\beta = 100$, voltage drop between emitter and base is $0.7\ V$ then value of V_{CE} will be
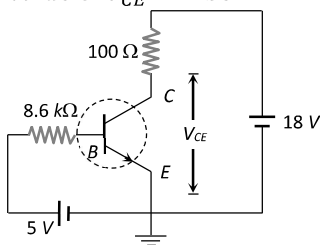
     a) $10\ V$ b) $5\ V$ c) $13\ V$ d) $0\ V$

568. In order to forward bias a PN junction, the negative terminal of battery is connected to
   a) P-side   b) Either P-side or N-side
   c) N-side   d) None of these

569. When a p-n junction diode is connected in forward bias its barrier potential
   a) Decreases and less current flows in the circuit
   b) Decreases and more current flows in the circuit
   c) Increases and more current flows in the circuit
   d) Decreases and no current flows in the circuit

570. The temperature (T) dependence on resistivity (ρ) of a semiconductor is represented by
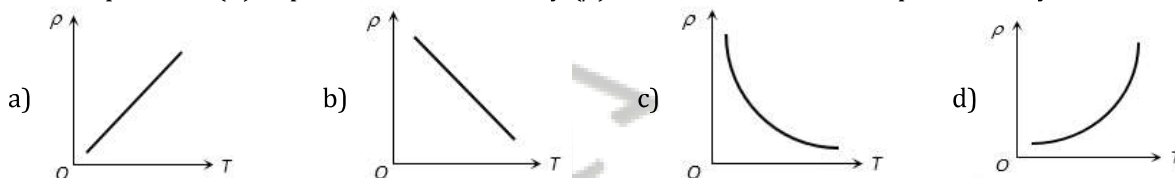
571. The circuit is equivalent to
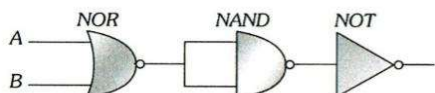
     a) NOR gate   b) OR gate   c) AND gate   d) NAND gate

572. n-p-n transistor are preferred to p-n-p transistor because they have
   a) Low cost   b) Low dissipation energy
   c) Capability of handling large power   d) Electrons having high mobility than holes

573. How many NAND gates are used in an OR gate?
   a) Four   b) Two   c) Three   d) Five

574. The electrical conductivity of a semiconductor increases when electromagnetic radiation of wavelength shorter than 2480 nm, is incident on it. The band gap in (eV) for the semiconductor is
   a) 1.1 eV   b) 2.5 eV   c) 0.5 eV   d) 0.7 eV

575. An n-p-n transistor can be considered to be equivalent to two diodes, connected. Which of the following figures is the correct one?

576. In an amplifier the load resistance R_L is equal to the plane resistance (r_p). The voltage amplification is equal to

     a) μ b) 2μ c) $\dfrac{\mu}{2}$ d) $\dfrac{\mu}{4}$

577. The majority charge carriers in P-type semiconductor are

a) Electrons   b) Protons   c) Holes   d) Neutrons

578. The electrical resistance of depletion layer is large because
     a) It has no charge carriers   b) It has a large number of charge carriers
     c) It contains electrons as charge carriers   d) It has holes as charge carriers

579. Absorption of X-Rays is maximum in which of the following material sheet of same thickness
     a) Cu b) Au c) Be d) Pb

580. In a given circuit as shown the two input waveforms A and B are applied simultaneously. The resultant waveform Y is
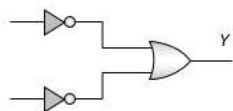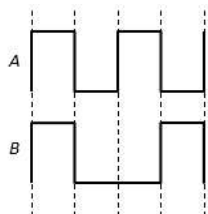
a)   b)   c)   d)

581. For a crystal system, $a = b = c, \alpha = \beta = \gamma \neq 90°$, the system is
     a) Tetragonal system   b) Cubic system
     c) Orthorhombic system   d) Rhombohedral system

582. For the given circuit of PN-junction diode, which of the following statement is correct
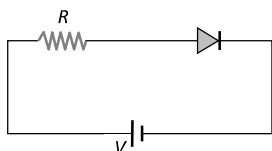
     a) In forward biasing the voltage across R is V
     b) In forward biasing the voltage across R is $2V$
     c) In reverse biasing the voltage across R is V
     d) In reverse biasing the voltage across R is $2V$

583. The point representing the cut off grid voltage on the mutual characteristic of triode is
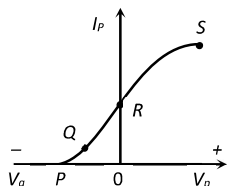
     a) S b) R c) O d) P

584. If the forward voltage in a semiconductor diode is doubled, the width of the depletion layer will
     a) Become half   b) Become one-fourth   c) Remain unchanged   d) Become double

585. Pure sodium (Na) is a good conductor of electricity because the $3s$ and $3p$ atomic bands overlap to form a partially filled conduction band. By contrast the ionic sodium chloride ($NaCl$) crystal is
     a) Insulator   b) Conductor   c) Semiconductor   d) None of these

586. The given figure shows the wave forms for two inputs A and B and that for the output Y of a logic circuit. The logic circuit is
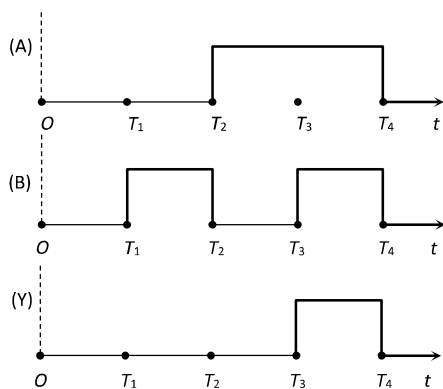
a) An AND gate   b) An OR gate   c) A NAND gate   d) An NOT gate

587. If control grid is made negative, then the plate current will
   a) Increase
   b) Remain constant
   c) Decrease
   d) Cannot say from given data

588. Zener breakdown takes place if
   a) Doped impurity is low
   b) Doped impurity is high
   c) Less impurity in N-part
   d) Less impurity in P-type

589. The symbol given in figure represents
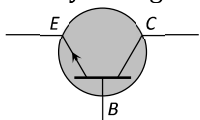
   a) NPN transistor
   b) PNP transistor
   c) Forward biased PN junction diode
   d) Reverse biased NP junction diode

590. In the CB mode of a transistor, when the collector voltage is changed by $0.5\ volt$. The collector current changes by $0.05\ mA$. The output resistance will be
   a) $10\ k\Omega$ b) $20\ k\Omega$ c) $5\ k\Omega$ d) $2.5\ k\Omega$

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

592. In the case of forward biasing of $p - n$ junction, which one of the following figures correctly depicts the direction of flow of carriers?
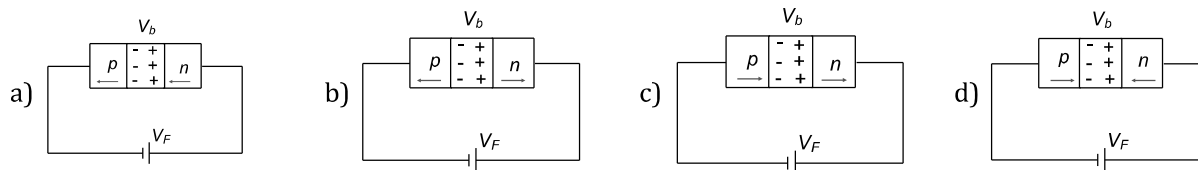
593. If α and β are the current gain in the CB and CE configurations respectively of the transistor circuit, then $\frac{\beta - \alpha}{\alpha\beta}$ is equal
   a) Infinite   b) 1   c) 2   d) 0.5

594. In the following circuit I_1 and I_2 are respectively
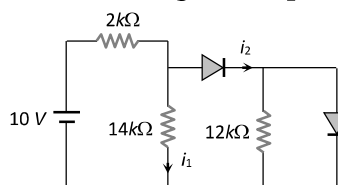
   a) $0, 0$ b) $5\ mA, 5\ mA$ c) $5\ mA, 0$ d) $0, 5\ mA$

595. The plate current in a triode is given by

$I_p = 0.004 \left(V_p + 10V_g\right)^{3/2} mA$

Where I_p, V_p and V_g are the values of plate current, plate voltage and grid voltage, respectively. What are the triode parameters μ, r_p and g_m for the operating point at $V_p = 120\ volt$ and $V_g = -2\ volt$

a) $10, 16.7\ k\Omega, 0.6\ m\ mho$ 　　　　　b) $15, 16.7\ k\Omega, 0.06\ m\ mho$

c) $20, 6\ k\Omega, 16.7\ m\ mho$ 　　　　　　d) None of these

596. When the two inputs of a NAND gate are shorted, the resulting gate is

a) NOR 　　　　b) OR 　　　　c) NOT 　　　　d) AND

597. Identify the logic operation performed by the circuit given here.
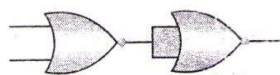
a) OR 　　　　b) NOR 　　　　c) NOT 　　　　d) NAND

598. If the ends p and n of $p-n$ diode junction are joined by a wire

a) There will not be a steady current in the circuit

b) There will be a steady current from n-side to p-side

c) There will be a steady current from p-side to n-side

d) There will not be a current depending upon the resistance of the connecting wire

599. The most commonly used material for making transistor is

a) Copper 　　　　b) Silicon 　　　　c) Ebonite 　　　　d) Silver

600. The energy gap of silicon is $1.5\ eV$. At what wavelength the silicon will stop to absorb the photon

a) $8250\ Å$ 　　　　b) $7250\ Å$ 　　　　c) $6875.5\ Å$ 　　　　d) $5000\ Å$

601. According to Bravis, the number of possible space lattice is

a) 18 　　　　b) 16 　　　　c) 14 　　　　d) 10

602. When a silicon PN junction is in forward biased condition with series resistance, it has knee voltage of $0.6\ V$. Current flow in it is $5\ mA$, when PN junction is connected with $2.6V$ battery, the value of series resistance is

a) $100\ \Omega$ 　　　　b) $200\ \Omega$ 　　　　c) $400\ \Omega$ 　　　　d) $500\ \Omega$

603. The grid voltage of any triode valve is changed from $-1\ volt$ to $-3\ volt$ and the mutual conductance is $3 \times 10^{-4}\ mho$. The change in plate circuit current will be
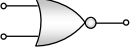
a) $0.8\ mA$ 　　　　b) $0.6\ mA$ 　　　　c) $0.4\ mA$ 　　　　d) $1\ mA$

604. When N-type of 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 remains same

d) Number of electrons and holes increases equally

605. A logic gate is an electronic circuit which

a) Makes logic decisions 　　　　　　b) Allows electrons flow only in one direction

c) Works binary algebra 　　　　　　d) Alternates between 0 and 1 values

606.
Symbol represents

a) NAND gate 　　　　b) NOR gate 　　　　c) NOT gate 　　　　d) XNOR gate

607. In a fcc lattice structure, what is the effective number of atoms?
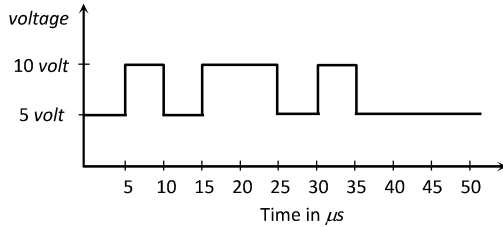
a) 4 　　　　b) 3 　　　　c) 2 　　　　d) 1

608. The decimal equivalent of the binary number $(11010.101)_2$ is

a) 9.625 　　　　b) 25.265 　　　　c) 26.625 　　　　d) 26.265

609. The output of an OR gate is connected to both the inputs of a NAND gate. The combination will serve as a

a) OR gate 　　　　b) NOT gate 　　　　c) NOR gate 　　　　d) AND gate

610. In a negative logic the following wave form corresponds to the

a) 0000000000   b) 0101101000   c) 1111111111   d) 1010010111

611. For a common base configuration of PNP transistor $\frac{I_C}{I_E} = 0.96$ then maximum current gain in common emitter configuration will be

     a) 12   b) 24   c) 6   d) 5

612. If the ratio of the concentration of electrons 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) $\frac{5}{8}$ b) $\frac{4}{5}$ c) $\frac{5}{4}$ d) $\frac{4}{7}$

613. Avalanche breakdown is due to

     a) Collision of minority charge carrier   b) Increase in depletion layer thickness

     c) Decrease in depletion layer thickness   d) None of these

614. In a PN-junction

     a) P and N both are at same potential

     b) High potential at N side and low potential at P side

     c) High potential at P side and low potential at N side

     d) Low potential at N side and zero potential at P side

615. Consider the junction diode is ideal. The value of current in the figure is

     a) Zero   b) 10^{-2}A   c) 10^{-1}A   d) 10^{-3}A

616. Current gain β_{AC} common emitter mode of transistor is

     a) $\beta_{AC} = \left(\frac{\Delta I_C}{\Delta I_B}\right), V_C = $ constant   b) $\beta_{AC} = \left(\frac{\Delta I_B}{\Delta I_C}\right), V_C = $ constant

     c) $\beta_{AC} = \left(\frac{\Delta I_C}{\Delta I_E}\right), V_C = $ constant   d) $\beta_{AC} = \left(\frac{\Delta I_E}{\Delta I_C}\right), V_C = $ constant

617. The output Y of the logic circuit shown in figure is best represented as

     a) $\bar{A} + \overline{B \cdot C}$ b) $A + \bar{B} \cdot C$ c) $\overline{A + B \cdot C}$ d) $\overline{A + \bar{B} \cdot C}$

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

Then the output signal across R_L will be

619. An oscillator in nothing but an amplifier with

     a) Positive feed back   b) Large gain   c) No feedback   d) Negative feedback

620. In order to rectify an alternating current one uses a
   a) Thermocouple   b) Diode   c) Triode   d) Transistor
621. Silicon is a semiconductor. If a small amount of As is added to it, then its electrical conductivity
   a) Decreases   b) Increases   c) Remains unchanged   d) Becomes zero
622. When a battery is connected to a P-type semiconductor with a metallic wire, the current in the semiconductor (predominantly), inside the metallic wire and that inside the battery respectively is due to
   a) Holes, electrons, ions   b) Holes, ions, electrons   c) Electrons, ions, holes   d) Ions, electrons, holes
623. The value of plate current in the given circuit diagram will be
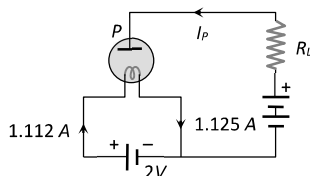
   a) $3\ mA$ b) $8\ mA$ c) $13\ mA$ d) $18\ mA$
624. Identify the incorrect statement regarding a superconducting wire
   a) Transport current flows through its surface
   b) Transport current flows through the entire area of cross-section of the wire
   c) It exhibits zero electrical resistivity and expels applied magnetic field
   d) It is used to produce large magnetic field
625. A common emitter amplifier given an output of 3 V for an input of 0.01 V. If β of the transistor is 100 and the input resistance is 1 kΩ, then the collector resistance is
   a) 1 kΩ   b) 3 kΩ   c) 30 kΩ   d) 30 Ω
626. In the grid circuit of a triode a signal $E = 2\sqrt{2}\cos \omega t$ is applied. If $\mu = 14$ and $r_p = 10\ k\Omega$ then root mean square current flowing through $R_L = 12\ k\Omega$ will be
   a) $1.27\ mA$ b) $10\ mA$ c) $1.5\ mA$ d) $12.4\ mA$
627. The voltage gain of triode amplifier is 30 and input voltage is $V_i = \sin 100\pi t$, then output voltage will be
   a) $30 \sin 100\ \pi t$ b) $\sin 100\ \pi t$ c) $-30 \sin 100\ \pi t$ d) $-\sin 100\ \pi t$
628. An amplifier has a voltage gain $A_V = 1000$. The voltage gain in dB is
   a) 30 dB   b) 60 dB   c) 3 dB   d) 20 dB
629. A transistor is operated in common-emitter configuration at $V_c = 2V$ such that a change in the base current from 100 μA produces a change in the collector current from 5 mA to 10 mA. The current gain is
   a) 75   b) 100   c) 150   d) 50
630. Which of the following figures correctly shows the phase relation between the input signal and the output signal of triode amplifier
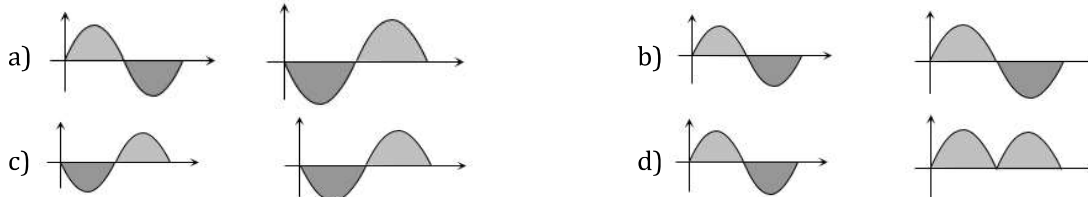
631. The current gain of a transistor in the common base mode is 0.9. If the change in the emitter current is 5 mA, the change in the collector current will be
   a) 4 mA   b) 4.5 mA   c) 5.6 mA   d) Zero
632. To write the decimal number 37 in binary, how many binary digits are required
   a) 5   b) 6   c) 7   d) 4
633. If the voltage between the terminals A and B is 17 V and Zener breakdown voltage is 9 V, then the potential across R is
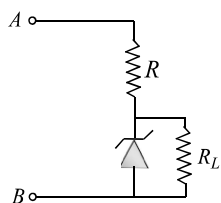
a) 6 V   b) 8 V   c) 9 V   d) 17 V

634. For a cubic crystal structure which one of the following relations indicating the cell characteristic is correct?

a) $a \neq b \neq c$ and $\alpha \neq \beta$ and $\gamma \neq 90^0$ b) $a \neq b \neq c$ and $\alpha = \beta = \gamma = 90^0$

c) $a = b = c$ and $\alpha \neq \beta \neq \gamma = 90^0$ d) $a = b = c$ and $\alpha = \beta = \gamma = 90^0$

635. The correct relation between the two current gains α and β in a transistor is

a) $\beta = \dfrac{\alpha}{1 + \alpha}$ b) $\alpha = \dfrac{\beta}{1 - \beta}$ c) $\alpha = \dfrac{\beta}{1 + \beta}$ d) $\alpha = \dfrac{1 + \beta}{\beta}$

636. The work function of oxide coated tungsten metal will be

a) 0.5 eV   b) 1.0 eV   c) 2.6 eV   d) 4.5 eV

637. The slopes of anode and mutual characteristics of a triode are $0.02 \ mA \ V^{-1}$ and $1 \ mA \ V^{-1}$ respectively. What is the amplification factor of the valve

a) 5   b) 50   c) 500   d) 0.5

638. A silicon diode has a threshold voltage of 7 V. If an input voltage given by $2 \sin (\pi t)$ is supplied to a half-wave rectifier circuit using this diode, the rectified output has a peak value of

a) 2 V   b) 1.4 V   c) 1.3 V   d) 0.7 V

639. A material has N atom in its crystal structure which is a hexagonal close packed. Then the number of electronic states in a band is

a) N b) $2N$ c) $4N$ d) $6N$

640. Zener diode is used as

a) Half wave rectifier   b) Full wave rectifier   c) Ac voltage stabilizer   d) Dc voltage stabilizer

641. A logic gate having two inputs A and B and output C has the following truth table.

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

It is

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

642. For a triode

a) $\mu = r_p \times g_m$ b) $g_m = \mu \times r_p$ c) $r_p = \mu \times g_m$ d) $\mu = \dfrac{r_p}{(r_p + g_m)}$

643. Which statement is correct

a) N-type germanium is negatively charged and P-type germanium is positively charged

b) Both N-type and P-type germanium are neutral

c) N-type germanium is positively charged and P-type germanium is negatively charged

d) Both N-type and P-type germanium are negatively charged

644. Function of rectifier is

a) To convert ac into dc b) To convert dc into ac c) Both (a) and (b)   d) None of these

645. In the given circuit
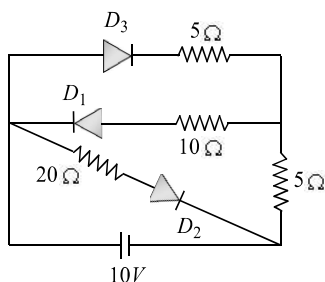
The current through the battery is

a) 0.5 A   b) 1 A   c) 1.5 A   d) 2 A

646. Which of the following statements is not true
    a) The resistance of intrinsic semiconductors decrease with increase of temperature
    b) Doping pure Si with trivalent gives P-types semiconductors
    c) The majority carriers in N-type semiconductors are holes
   d) A PN-junction can act as a semiconductor diode

647. The probability of electrons to be found in the conduction band of an intrinsic semiconductor at a finite temperature
    a) Decreases exponentially with increasing band gap
    b) Increases exponentially with increasing band gap
    c) Decreases with increasing temperature
    d) Is independent of the temperature and the band gap

648. In a properly biased transistor
    a) Both depletion layers are equally large
    b) Both depletion layers are equally small
    c) Emitter-base depletion layer is large but base-collector depletion layer is small
    d) Emitter-base depletion layer is small but base-collector depletion layer is large

649. In the energy band diagram of a material shown below, the open circles and filled circles denote holes and electrons respectively. The material is
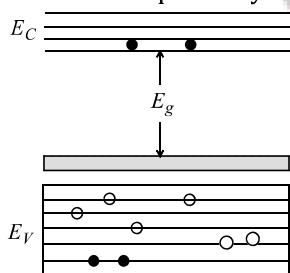
a) A p-type semiconductor   b) An insulator
c) A metal   d) An n-type semiconductor

650. In an unbiased $p - n$ junction, holes diffuse from p-region to n-region, because
    a) Free electrons in the n-region attract them
    b) They move across the junction by the potential difference
    c) Hole concentration in p-region is more as compared to n-region
    d) All of the above

651. 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

652. Which represents NAND gate
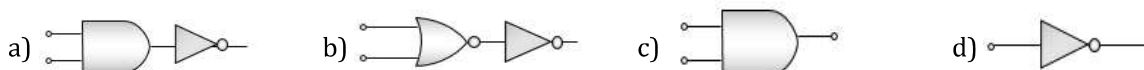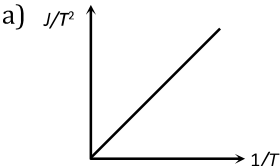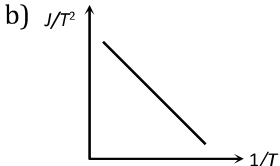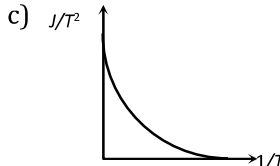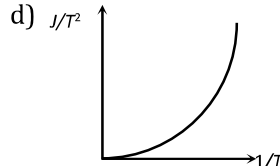
653. In a triode valve the amplification factor is 20 and mutual conductance is 10^{-3} mho. The plate resistance is

a) $2 \times 10^3 \ \Omega$ b) $4 \times 10^3 \ \Omega$ c) $2 \times 10^4 \ \Omega$ d) $2 \times 10^5 \ \Omega$

654. A conductor and a semiconductor are connected in parallel as shown in the figure. At a certain voltage both ammeters register the same current. If the voltage of the DC source is increased then the
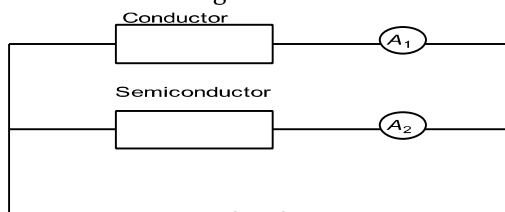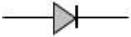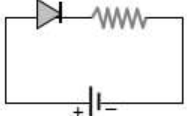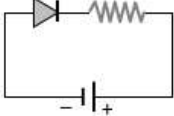

a) Ammeter connected to the semiconductor will register higher current than the ammeter connected to the conductor
b) Ammeter connected to the conductor will register higher current than the ammeter connected to the semiconductor
c) Ammeters connected to both semiconductor and conductor will register the same current
d) Ammeters connected to both semiconductor and conductor will register no change in the current

655. The resistivity of a semiconductor at room temperature is in between
a) 10^{-2} to $10^{-5}\Omega$ cm b) 10^2 to $10^6\Omega$ cm c) 10^6 to $10^8\Omega$ cm d) 10^{10} to $10^{12}\Omega$ cm

656. In semiconductor the concentration of electrons and holes are $8 \times 10^{18}/m^3$ and $5 \times 10^{18}/m$ respectively. If the mobilities of electrons and holes are 2.3 $m^2/volt$-s and 0.01 m^2/vol-s respectively, then semiconductor is
a) N-type and its respectively is 0.34 ohm-$metre$
b) P-type and its respectively is 0.034 ohm-$metre$
c) N-type and its respectively is 0.034 ohm-$metre$
d) P-type and its respectively is 3.40 ohm-$metre$

657. LED is a p-n junction diode which is
a) Forward biased
b) Either forward biased or reverse biased
c) Reverse biased
d) Neither forward biased nor reverse biased

658. Boolean algebra is essentially based on
a) Truth b) Logic c) Symbol d) Numbers

659. If the thermionic current density is J and emitter temperature is T then the curve between $\frac{J}{T^2}$ and $\frac{1}{T}$ will be

a)   b)   c)   d)

660. When the electrical of a semi- conductor is due to the breaking of its covalent bonds, then the semiconductor is said to be
a) Donor b) Acceptor c) Intrinsic d) Extrinsic

661. Metallic solids are always opaque because
a) Solids effect the incident light
b) Incident light is readily absorbed by the free electrons in a metal
c) Incident light is scattered by solid molecules
d) Energy band traps the incident light

662. The coordination number of simple cubic crystal is
a) 6 b) 8 c) 12 d) 16

663. In a diode valve the cathode temperature must be (ϕ = work function)
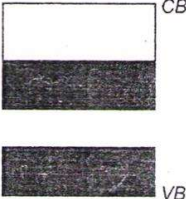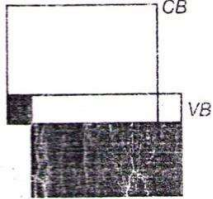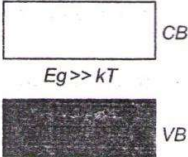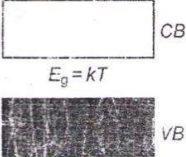a) High and ϕ should be high b) High and ϕ should be Low

c) Low and ϕ should be high d) Low and ϕ should be low

664. If N_P and N_e be the numbers of holes and conduction electrons in an extrinsic semiconductor, then
     a) $N_P > N_e$
     b) $N_P = N_e$
     c) $N_P < N_e$
     d) $N_P > N_e$ or $N_P < N_e$ depending on the nature of impurity

665. Thermionic emission from a heated filament varies with its temperature T as
     a) T^{-1} b) $T\ T$ c) T^2 d) $T^{3/2}$

666. In a PNP transistor working as a common-base amplifier, current gain is 0.96 and emitter current is 7.2 mA. The base current is
     a) 0.4 mA b) 0.2 mA c) 0.29 mA d) 0.35 mA

667. In a common-base mode of a transistor, the collector current is 5.488 mA for an emitter current of 5.60 mA. The value of the base current amplification factor (β) will be
     a) 49 b) 50 c) 51 d) 48

668. In case of a $p-n$ junction diode at high value of reverse dias, the current rises sharply. The value of reverse bias is known as
     a) Cut-off voltage b) Zener voltage c) Inverse voltage d) Critical voltage

669. The combination of 'NAND' gates shown here under figure, are equivalent to
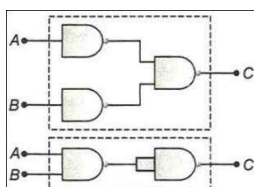
     a) An OR gate and an AND gate respectively
     b) An AND gate and a NOT gate respectively
     c) An AND gate and an OR gate respectively
     d) An OR gate and a NOT gate respectively

670. In PN-junction diode the reverse saturation current is $10^{-5}\ amp$ at $27°C$. The forward current for a voltage of 0.2 $volt$ is
     $[\exp(7.62) = 2038.6, k = 1.4 \times 10^{-23} J/K]$
     a) $2037.6 \times 10^{-3}\ amp$ b) $203.76 \times 10^{-3}\ amp$ c) $20.376 \times 10^{-3}\ amp$ d) $2.0376 \times 10^3\ amp$

671. Energy bands in solids are a consequence of
     a) Ohm's law
     b) Pauli's exclusion principle
     c) Bohr's theory
     d) Heisenberg's uncertainty principle

672. Which of the following materials is the best conductor of electricity
     a) Platinum b) Gold c) Silicon d) Copper

673. A $p-n$ junction diode contains a depletion layer
     a) Only if it is unbiased
     b) Only if is forward biased
     c) Only if it is reverse biased
     d) Irrespective of whether it is biased or unbiased

674. The concentration of impurities in a transistor are
     a) Equal for the emitter, base and collector regions
     b) Least for the emitter region
     c) Largest for the emitter region
     d) Largest for the base region

675. Which one is in forward bias

a)   b)   c)   d) None of these

676. Which of the energy band diagrams shown in the figure corresponds to that of a semiconductor?

a)   b)   c)   d)

677. The resistance of a germanium junction diode whose $V - I$ is shown in figure is ($V_k = 0.3\ V$)
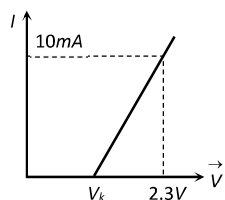
   a) $5\ k\Omega$ b) $0.2\ k\Omega$ c) $2.3\ k\Omega$ d) $\left(\dfrac{10}{2.3}\right) k\Omega$

678. If a zener diode ($V_Z = 5$ V and $I_Z = 10$ mA) is connected in series with a resistance and 20 V is applied across the combination, then the maximum resistance one can use without spoiling zener action is
   a) 20 kΩ   b) 15 kΩ   c) 10 kΩ   d) 1.5 kΩ

679. Which of the following statements is true for an n-type semiconductor?
   a) The donor level lies closely below the bottom of the conduction band.
   b) The donor level lies closely above the top of the valence band
   c) The donor level lies at the halfway mark of the forbidden energy gap
   d) None of the above

680. Amplification factor of a triode is 10. When the plate potential is 200 $volt$ and grid potential is $-4\ volt$, then the plate current of $4mA$ is observed. If plate potential is changed to 160 $volt$ and grid potential is kept at $-7\ volt$, then the plate current will be
   a) $1.69\ mA$ b) $3.95\ mA$ c) 2.87 d) $7.02\ mA$

681. In a PN junction photo cell, the value of photo-electromotive force produced by monochromatic light is proportional to
   a) The voltage applied at the PN junction
   b) The barrier voltage at the PN junction
   c) The intensity of the light falling on the cell
   d) The frequency of the light falling on the cell

682. The transconductance of a triode amplifier is 2.5 $mili\ mho$ having plate resistance of 20 $k\Omega$, amplification 10. Find the load resistance
   a) $5\ k\Omega$ b) $25\ k\Omega$ c) $20\ k\Omega$ d) $50\ k\Omega$

683. When germanium is doped with phosphorus, the doped material has
   a) Excess positive charge   b) Excess negative charge
   c) More negative current carriers   d) More positive current carriers

684. Three semi-conductors are arranged in the increasing order of their energy gap as follows. The correct arrangement is
   a) Tellurium, germanium, silicon   b) Tellurium, silicon, germanium
   c) Silicon, germanium, tellurium   d) Silicon, tellurium, germanium

685. If $R_P = 7k\Omega$, $g_m = 2.5\ millimho$, then on increasing plate voltage by $50V$, how much the grid voltage is changed so that plate current remains the same

a) $-2.86\ V$ b) $-4\ V$ c) $+4\ V$ d) $+2\ V$

686. The dominant mechanism for motion of charge carriers in forward and reverse biased silicon *P-N* junctions are
   a) Drift in forward bias, diffusion in reverse bias
   b) Diffusion in forward bias, drift in reverse bias
   c) Diffusion in both forward and reverse bias
   d) Drift in both forward and reverse bias

687. Which of these is unipolar transistor
   a) Point contact transistor   b) Field effect transistor
   c) *PNP* transistor   d) None of these

688. When and *P* end of *P-N* junction is connected to the negative terminal of the battery and the *N* end to the positive terminal of the battery, then the *P-N* junction behaves like
   a) A conductor   b) An insulator   c) A super-conductor   d) A semi-conductor

689. In the circuit given the current through the zener diode is
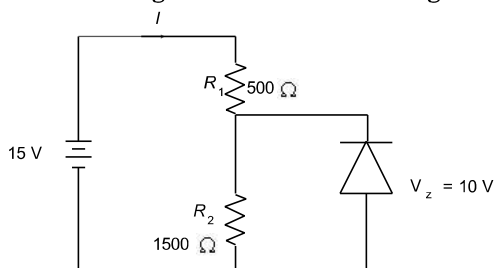
   a) 10 mA   b) 6.67 mA   c) 5 mA   d) 3.33 mA

690. A semiconductor *X* is made by doping a germanium crystal with arsenic ($Z = 33$). A second semiconductor *Y* is made by doping germanium with indium ($Z = 49$). The two are joined end to end and connected to a battery as shown. Which of the following statements is correct
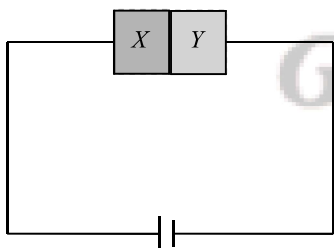
   a) *X* is *P*-type, *Y* is *N*-type and the junction is forward biased
   b) *X* is *P*-type, *Y* is *P*-type and the junction is forward biased
   c) *X* is *P*-type, *Y* is *N*-type and the junction is reverse biased
   d) *X* is *N*-type, *Y* is *P*-type and the junction is reverse biased

691. Which one of the following statement is FALSE
   a) The resistance of intrinisic semiconductor decreases with increase of temperature
   b) Pure *SI* doped with trivalent impurities gives a p-type semiconductor
   c) Majority carriers in a n-type semiconductor are holes
   d) Minority carriers in a p-type semiconductor are electrons

692. A working transistor with its three legs marked *P*, *Q* and *R* is tested using a multimeter. No conduction is found between *P* and *Q*. By connecting the common (negative) terminal of the multimeter to *R* and the other (positive) terminal to *P* or *Q*, some resistance is seen on the multimeter. Which of the following is true for the transistor?
   a) It is an *n-p-n* transistor with *R* as base
   b) It is an *p-n-p* transistor with *R* as collector
   c) It is an *p-n-p* transistor with *R* as emitter
   d) It is an *n-p-n* transistor with *R* as collector

693. In a junction diode, the direction of diffusion current is
    a) From n-region to p-region
    b) From p-region to n-region
    c) From n-region to p-region if the junction is forward baised and *vice versa* if it is reverse baised
    d) From p-region to n-region if the junction is forward baised and *vice versa* if it is reversed baised
694. Which of the following is correct, about doping in a transistor?
    a) Emitter is lightly doped, collector is heavily doped and base is moderately doped
    b) Emitter is lightly doped, collector is moderately doped and base is heavily doped
    c) Emitter is heavily doped, collector is lightly doped and base is moderately doped
    d) Emitter is heavily doped, collector is moderately doped and base is lightly doped
695. in P-type semiconductor the majority and minority charge carriers are respectively
    a) Protons and electrons   b) Electrons and protons
    c) Electrons and holes   d) Holes and electrons
696. Intrinsic semiconductor is electrically neutral. Extrinsic semiconductor having large number of current carriers would be
    a) Positively charged
    b) Negatively charged
    c) Positive charged or negatively charged depending upon the type of impurity that has been added
    d) Electrically neutral
697. In the half wave rectifier circuit operating from 50 Hz mains frequency, the fundamental frequency in the rippel would be
    a) 25 Hz   b) 50 Hz   c) 70.7 Hz   d) 100 Hz
698. In a transistor, the base is
    a) A conductor of low resistance   b) A conductor of high resistance
    c) An insulator   d) An extrinsic semiconductor
699. The current I through 10 Ω resistor in the circuit given below is
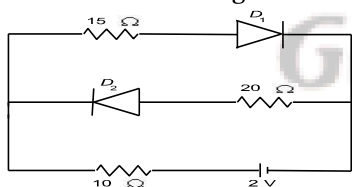
    a) 50 mA   b) 20 mA   c) 40 mA   d) 80 mA
700. Electrical conductivity of a semiconductor
    a) Increases with the rise in its temperature
    b) Decrease with the rise in its temperature
    c) Decrease does not change with the rise in its temperature
    d) First increase and then decreases with the rise in its temperature
701. The maximum efficiency of full wave rectifier is
    a) 100 %   b) 25.20 %   c) 40.6 %   d) 81.2 %
702. In the case of forward biasing of a p-n junction diode, which one of the following figures correctly depicts the direction of conventional current (indicated by an arrow mark)?
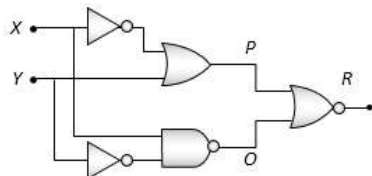
c)

d)
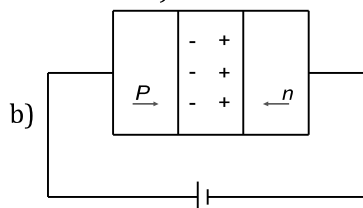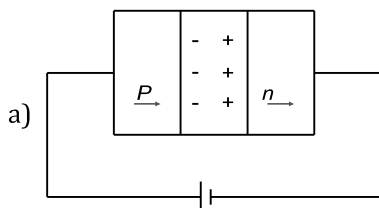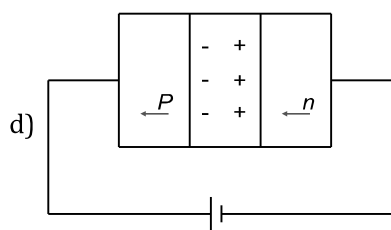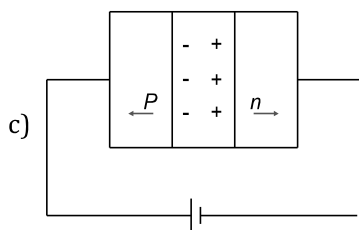
703. A transistor has a base current of 1 mA and emitter current 90 mA. The collector current will be
a) 90 mA b) 1 mA c) 89 mA d) 91 mA

704. Figure gives a system of logic gates. From the study of truth table it can be found that to produce a high output (1) at R, we must have


a) $X = 0, Y = 1$ b) $X = 1, Y = 1$ c) $X = 1, Y = 0$ d) $X = 0, Y = 0$

705. On applying a potential of -1 $volt$ at the grid of a triode, the following relation between plate voltage V_p $(volt)$ and plate current I_p (in mA) is found $I_p = 0.125\,V_p - 7.5$. If on applying -3 $volt$ potential at grid and $300\,V$ potential at plate, the plate current is found to be $5mA$, then amplification factor of the triode is
a) 100 b) 50 c) 30 d) 20

706. Two identical p-n junctions are connected in series in three different ways as shown below to a battery. The potential drop across the p-n junctions are equal in
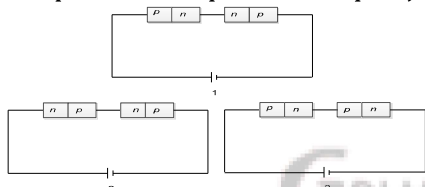
a) Circuits 2 and 3 b) Circuits 1 and 2 c) Circuits 1 and 3 d) None of the circuit

707. In a full wave rectifiers, input ac current has a frequency 'v'. The output frequency of current is
a) $v/2$ b) v c) $2v$ d) None of these

708. The correct relation for a triode is

a) $g_m = \left|\dfrac{\Delta I_p}{\Delta V_p}\right|_{V_g=constt}$ b) $g_m = \left|\dfrac{\Delta I_p}{\Delta V_g}\right|_{V_p=constt}$ c) Both d) None of these

709. Avalanche breakdown in a p-n junction diode is due to
a) Sudden shift of Fermi level
b) Increase in the width of forbidden gap
c) Sudden increase of impurity concentration
d) Cumulative effect of increased electron collision and creation of added electron-hole pairs

710. Two ideal diodes are connected to a battery as shown in the circuit. The current supplied by the battery is
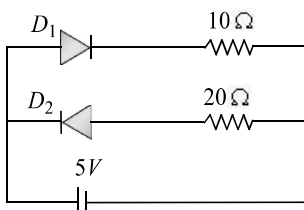
a) $0.75\,A$ b) Zero c) $0.25\,A$ d) $0.5\,A$

711. To get an output $Y = 1$ from the circuit shown, the inputs A, B and C must be respectively
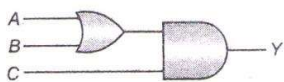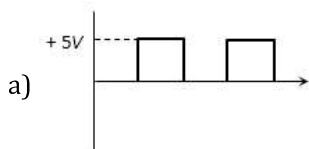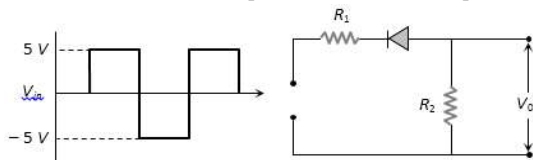
a) 0, 1, 0   b) 1, 0, 0   c) 1, 0, 1   d) 1, 1, 0

712. Resistivity of a semiconductor depends on
    a) Shape of semiconductor
    b) Atomic nature of semiconductor
    c) Length of semiconductor
    d) Shape and atomic nature of semiconductor

713. A waveform shown when applied to the following circuit will produce which of the following output waveform? Assuming ideal diode configuration and $R_1 = R_2$
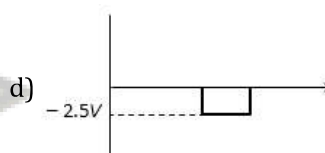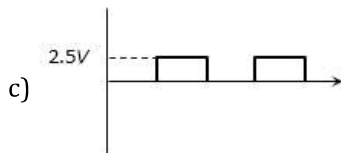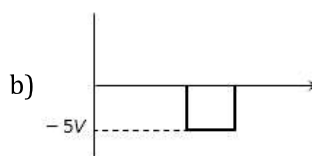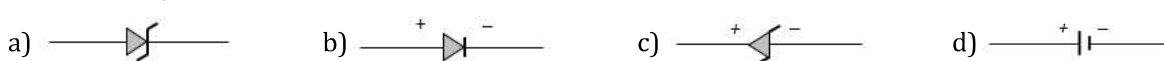

714. A reverse biased diode is
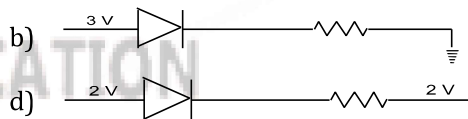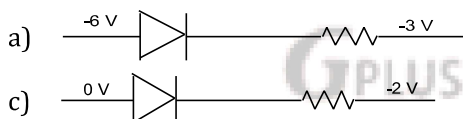
715. For an insulator the forbidden energy gap is
    a) Zero   b) 1 eV   c) 5 eV   d) 2 eV

716. The correct symbol for zener diode is

717. What is the output Y of the gate circuit shown in figure?

    a) $A \cdot B$ b) $\bar{A} \cdot \bar{B}$ c) $\bar{A} \cdot \bar{B}$ d) $\overline{A \cdot B}$

718. GaAs (with a band gap $= 1.5\ eV$) as an LED can emit
    a) Blue light   b) Green light   c) Ultraviolet rays   d) Infrared rays

719. Atomic radius of fcc is
    a) $\dfrac{a}{2}$ b) $\dfrac{a}{2\sqrt{2}}$ c) $\dfrac{\sqrt{3}}{4}a$ d) $\dfrac{\sqrt{3}}{2}a$

720. 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 empty