SHIKSHA CLASSES,BHANDARA

Subject : Physics **Topic : Electronic Devices** **M.M. : 180**

Marking Scheme:
(i) Each question is allotted 4 (four) marks for each correct response.
(ii) ¼ (one fourth) marks will be deducted for indicating incorrect response of each question. No deduction from the total score will be made if no response is indicated for an item in the answer sheet.

Q.1 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 reversed, the current drops almost to zero. The device may be
(1) A P-type semiconductor
(2) An N-type semiconductor
(3) A PN-junction
(4) An intrinsic semiconductor

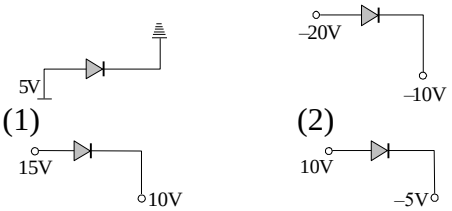
Q.2 The approximate ratio of resistances in the forward and reverse bias of the PN-junction diode is
(1) $10^2 : 1$ (2) $10^{-1} : 1$
(3) $1 : 10^{-4}$ (4) $1 : 10^4$

Q.3 The breakdown in a reverse biased p–n junction diode is more likely to occur due to
I. large velocity of the minority charge carriers if the doping concentration is small.
II. large velocity of the minority charge carriers if the doping concentration is large.
III. strong electric field in a depletion region if the doping concentration is small.
IV. strong electric field in the depletion region if the doping concentration is large.
(1) I and IV (2) II and III
(3) I and III (4) II and IV

Q.4 In P-N junction, avalanche current flows in circuit when biasing is
(1) Forward (2) Reverse
(3) Zero (4) Excess

Q.5 Avalanche breakdown is due to
(1) Collision of minority charge carrier
(2) Increase in depletion layer thickness
(3) Decrease in depletion layer thickness
(4) None of these

Q.6 Which is reverse biased diode



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

Q.7 When the 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
(1) A conductor (2) An insulator
(3) A super-conductor (4) A semi-conductor

Q.8 In a PN junction photo cell, the value of photo-electromotive force produced by monochromatic light is proportional to
(1) The voltage applied at the PN junction
(2) The barrier voltage at the PN junction
(3) The intensity of the light falling on the cell
(4) The frequency of the light falling on the cell

Q.9 A diode having potential difference 0.5 V across its junction which does not depend on current, is connected in series with resistance of 20 Ω across source. If 0.1 A passes through resistance then what is the voltage of the source
(1) 1.5 V (2) 2.0 V
(3) 2.5 V (4) 5 V

Q.10 In a transistor, a change of 8.0 mA in the emitter current produces a change of 7.8 mA in the collector current. What change in the base current is necessary to produce the same change in the collector current ?
(1) 50 μA (2) 100 μA
(3) 150 μA (4) 200 μA

Q.11 The logic behind 'NOR' gate is that it gives
(1) High output when both the inputs are low.
(2) Low output when both the inputs are low.
(3) High output when both the inputs are high.
(4) None of these

Q.12 How many NAND gates are used to form an AND gate
(1) 1 (2) 2 (3) 3 (4) 4

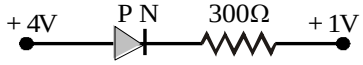
Q.13 The given truth table is of

A	0	1
X	1	0

(1) OR gate (2) AND gate
(3) NOT gate (4) None of above

Q.14 The electrical circuit used to get smooth dc output from a rectifier circuit is called
(1) Oscillator (2) Filter
(3) Amplifier (4) Logic gates

Q.15 In the circuit given, the value of the current is



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

Q.16 Zener breakdown takes place if
(1) Doped impurity is low
(2) Doped impurity is high
(3) Less impurity in N-part
(4) Less impurity in P-type

Q.17 A common emitter amplifier is designed with NPN transistor ($\alpha = 0.99$). The input impedance is 1 KΩ and load is 10 KΩ. The voltage gain will be
(1) 9.9 (2) 99
(3) 990 (4) 9900

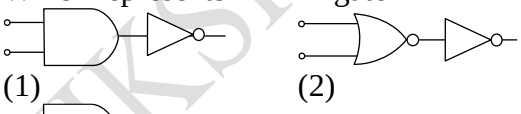
Q.18 In a common base amplifier circuit, calculate the change in base current if that in the emitter current is 2 mA and $\alpha = 0.98$
(1) 0.04 mA (2) 1.96 mA
(3) 0.98 mA (4) 2 mA

Q.19 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
(1) NOR (2) OR
(3) NAND (4) AND

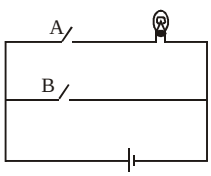
Q.20 Which represents NAND gate



(1) (2)

(3) (4)

Q.21 The truth table for the electrical circuit shown is



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

(1)

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

(2)

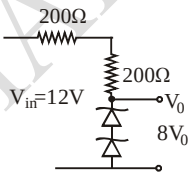
A	B	Y
0	0	0
0	1	0
1	0	1
1	1	0

(3)

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

(4)

Q.22 The circuit shown below is working as a 8 V dc regulated voltage source. When 12 V is used as input, the power dissipated (in mW) in each diode is; (considering both zener diodes are identical)



(1) 40 (2) 30
(3) 20 (4) 10

Q.23 Choose the correct option –
(1) In a transistor, base part is least size and least doped.
(2) On increasing the reverse bias to a large value in a P–N junction diode current suddenly increases.
(3) Only (1) is correct
(4) Both (1) and (2) are correct

Q.24 When npn transistor is used as an amplifier –
(1) electrons move from collector base.
(2) holes move from emitter to base.
(3) electrons move from base to collector.
(4) holes move from base to emitter.

Q.25 n-type semiconductors will be obtained, when germanium is doped with
(1) phosphorus (2) aluminium
(3) arsenic (4) either (1) or (3)

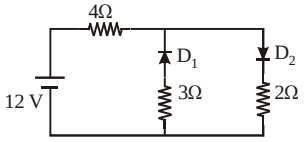
Q.26 In a common base amplifier the phase difference between the input signal voltage and output voltage is
(1) $\pi/4$ (2) π
(3) 0 (4) $\pi/2$

Q.27 If the ratio of the concentration of electrons to that of holes in a semiconductor is 7/5 and the ratio of currents is 7/4, then what is the ratio of their drift velocities –

(1) 5/4 (2) 4/7
(3) 5/8 (4) 4/5

Q.28 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 (β) will be –
(1) 51 (2) 48
(3) 49 (4) 50

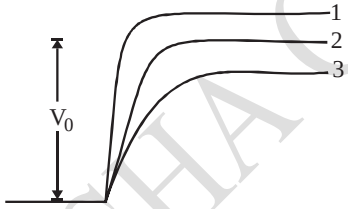
Q.29 The circuit has two oppositely connected ideal diodes in parallel. What is the current flowing in the circuit



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

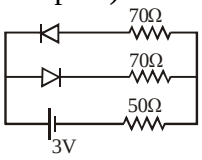
Q.30 A semiconductor has equal electron and hole concentration of 6×10^8 per m^3. On doping with certain impurity, electron concentration increases to 9×10^{12} per m^3. The new hole concentration is
(1) 2×10^4 per m^3 (2) 2×10^2 per m^3
(3) 4×10^4 per m^3 (4) 4×10^2 per m^3

Q.31 In Fig., V_0 is the potential barrier across a p-n junction, when no battery is connected across the junction



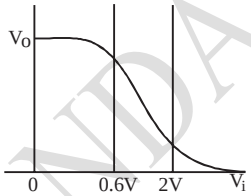
(1) 1 and 3 both correspond to forward bias of junction.
(2) 3 corresponds to forward bias of junction and 1 corresponds to reverse bias of junction.
(3) 1 corresponds to forward bias and 3 corresponds to reverse bias of junction.
(4) 3 and 1 both correspond to reverse bias of junction.

Q.32 The circuit shown in the figure contains two diodes each with a forward resistance of 30Ω and with infinite backward resistance. If the battery is 3 V, the current through the 50Ω resistance (in ampere) is –



(1) zero (2) 0.01 (3) 0.02 (4) 0.03

Q.33 Base biased CE transistor has the transfer characteristics as shown

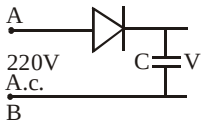


Which of the following statements are correct ?
I. At $V_i = 0.4V$, transistor is in active state.
II. At $V_i = 1V$, it can be used as an amplifier.
III. At $V_i = 0.5V$, it can be used as a switch turned off.
IV. At $V_i = 2.5V$, it can be used as a switch turned on.
(1) I, II and III (2) II, III and IV
(3) I, II and IV (4) I, III and IV

Q.34 Which of the given statements are correct regarding unbiased p-n junction?
I. Drift and diffusion currents occurs p to n-side.
II. Initially diffusion current is large and drift current is small.
III. Finally diffusion and drift currents grow to be equal in magnitude.
IV. Under equilibrium there is no net current across p-n junction's plane.
(1) I and IV (2) I, II and III
(3) II, III and IV (4) All of these

Q.35 To make a p-type semiconductor, germanium is doped with –
(1) gallium (2) boron
(3) aluminium (4) Any of these

Q.36 A 220 V A.C. supply is connected between points A and B (Fig.). What will be the potential difference V across the capacitor?



(1) 220V (2) 110V
(3) 0V (4) 220V

Q.37 In the depletion region of a diode
I. there are no mobile charges
II. equal number of holes and electrons exist, making the region neutral.
III. recombination of holes and electrons has taken place.
IV. immobile charged ions exist.
(1) I, II and III (2) II, III and IV
(3) I, II and IV (4) I, III and IV

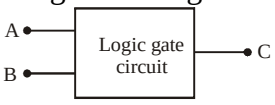
Q.38 Choose the only false statement from the following
(1) In conductors, the valence and conduction band may overlap.
(2) Substances with energy gap of the order of 10eV are insulators.
(3) The resistivity of a semiconductor increases with increase in temperature.
(4) The conductivity of a semiconductor increases with increase in temperature.

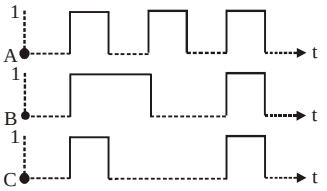
Q.39 Carbon, silicon and germanium atoms have four valence electrons each. Their valence and conduction bands are separated by energy band gaps represented by $(E_g)_C$, $(E_g)_{Si}$ and $(E_g)_{Ge}$ respectively. Which one of the following relationships is true in their case ?
(1) $(E_g)_C > (E_g)_{Si}$ (2) $(E_g)_C < (E_g)_{Si}$
(3) $(E_g)_C = (E_g)_{Si}$ (4) $(E_g)_C < (E_g)_{Ge}$

Q.40 Application of a forward bias to a p-n junction
(1) widens the depletion zone.
(2) increases the potential difference across the depletion zone.
(3) increases the number of donors on the n side.
(4) increases the electric field in the depletion zone.

Q.41 Zener diode is used for –
(1) Amplification
(2) Rectification
(3) Stabilisation
(4) Producing oscillations in an oscillator

Q.42 The following figure shows a logic gate circuit with two inputs A and B and the output C. The voltage wavefronts of A, B and C are as shown below. The logic circuit gate is

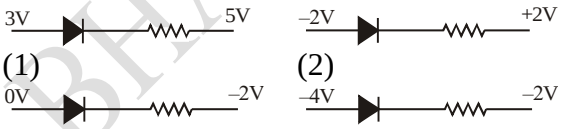




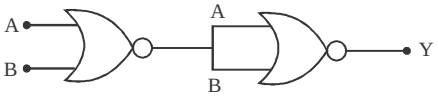
(1) NAND gate (2) NOR gate
(3) OR gate (4) AND gate

Q.43 A transistor is operated in common emitter configuration at constant collector voltage V_C = 1.5V such that a change in the base current from 100µA to 150µA produces a change in the collector current from 5mA to 10mA. The current gain (2) is –
(1) 75 (2) 100
(3) 50 (4) 67

Q.44 A forward biased diode is –



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



(1)

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

(2)

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

(3)

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

(4)

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