

SHORT QUESTIONS

18.1 How does the motion of an electron in a n-type substance differ from the motion of holes in a p-type substance?

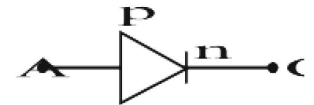
Ans. As we know that the majority charge carriers in N-type substances are free electron and majority charge carriers in P-type substances are holes. Both electrons and holes are moving in opposite direction. The motion of electrons in N-type substances is much faster than the motion of holes in P-type substances.

18.2 What is the net charge on a n-type or a p-type substance?

Ans. P-type and N-type substances are neutral. Since they are made as a result of combination of atoms of intrinsic semi-conductors and atoms of impurity. Atom as whole is neutral therefore there is no net charge on P-type or N-type substance.

18.3 The anode of a diode is 0.2 V positive with respect to its cathode. Is it forward-biased?

Ans. If the anode of the diode (P-type substance) is at higher potential 0.2 volt (positive) with respect to cathode (N-type substance), so P-n junction is forward biased.



18.4 Why charge carriers are not present in the depletion region?

Ans. In p-n-junction, n-region contains free electrons and p-region contain holes. As electrons in the n-region due to their random motion diffuse into the p-region. As a result of their diffusion, the recombination of electrons and holes take place within depletion region since the charge carriers are removed so chargeless region is formed in which charge carriers are not present so depletion region has no charge carriers.

18.5 What is the effect of forward and reverse biasing of a diode on the width of depletion region?

Ans. When a diode is forward biased, the width of depletion region decreases while when a diode is reversed biased, the width of depletion region is increased.

18.6 Why ordinary silicon diodes do not emit light?

Ans. There are two reasons for ordinary silicon diode do not emit light.

- (i) Opaque nature of silicon.
- (ii) In forward biased condition when electrons recombine with holes energy will release in the form of photons whose wavelength will lies in invisible region because their wavelength will be greater than visible region.

18.7 Why a photo diode is operated in reverse biased state?

Ans. Photodiode is basically the device used for the detection of light. In the absence of light, current is negligible due to reverse biased state. As light falls on it, then electron-hole pair is created due to which reverse current increases and hence light can be detected.

18.8 Why is the base current in a transistor very small?

Ans. As base is very thin of the order of 10^{-6} m then emitter and collector and also impurity ratio in base is very small as compared to emitter and collector. Secondary the voltage between collector to base is very large as compared to voltage between base to emitter. That is why, the base current in a transistor is very small.

18.9 What is the biasing requirement of the junctions of a transistor for its normal operation? Explain how these requirements are met in a common emitter amplifier?

Ans. For normal operations of transistors, batteries V_{BB} and V_{CC} are connected in such a way that its emitter-base junction is forward biased and its collector-base junction is reverse biased. V_{CC} is of much higher value than V_{BB} .

For common emitter amplifier V_{BB} forward biases, the base-emitter junction and V_{CC} reverse biases the collector base junction.

18.10 What is the principle of virtual ground? Apply it to find the gain of an inverting amplifier.

Ans. Figure shows operational amplifier as an inverting amplifier.

$$\text{As } A_{OL} = \frac{V_o}{V_+ - V_-}$$

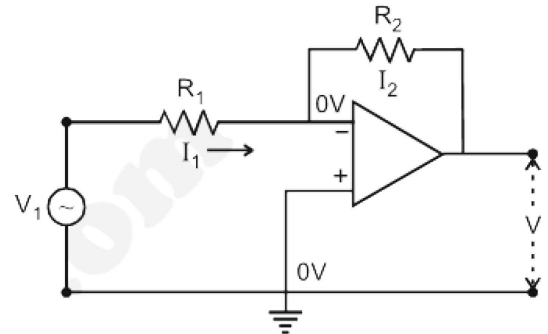
$$V_+ - V_- = \frac{V_o}{A_{OL}}$$

$$\text{Since } A_{OL} = 10^5$$

$$\therefore V_+ - V_- = \frac{V_o}{10^5}$$

$$V_+ - V_- \approx 0$$

$$V_+ \approx V_-$$



Since V_+ is at ground so V_- is virtually at ground potential i.e., $V_- \approx 0$. This is known as virtual ground principle.

18.11 The inputs of a gate are 1 and 0. Identify the gate if its output is (a) 0, (b) 1.

Ans. The inputs of a gate are 1 and 0. Identify the gate if its input is (a) 0 and (b) 1.

(a) AND gate (b) OR gate

18.12 Tick (✓) the correct answer

(i) A diode characteristic curve is a plot between

- (a) current and time
- (b) voltage and time
- (c) voltage and current
- (d) forward voltage and reverse voltage

(ii) The colour of light emitted by a LED depends on

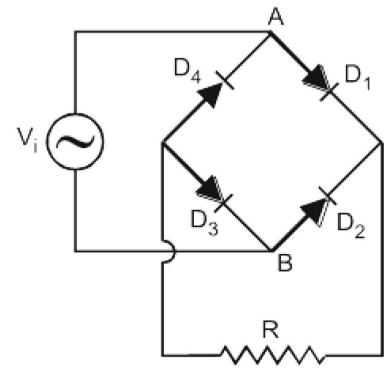
- (a) its forward bias
- (b) its reverse bias
- (c) the amount of forward current
- (d) the type of semi-conductor material used

(iii) In a half-wave rectifier the diode conducts during

- (a) both halves of the input cycle
- (b) a portion of the positive half of the input cycle
- (c) a portion of the negative half of the input cycle
- (d) one half of the input cycle

(iv) In a bridge rectifier of Fig. Q, when V_i is positive at point B with respect to point A, which diodes are ON

- (a) D_2 and D_4
- (b) D_1 and D_3
- (a) D_2 and D_3
- (b) D_1 and D_4



(v) The common emitter current amplification factor β is given by

- (a) $\frac{I_C}{I_E}$
- (b) $\frac{I_C}{I_B}$
- (c) $\frac{I_E}{I_B}$
- (d) $\frac{I_B}{I_E}$

(vi) Truth table of logic function

- (a) summarizes its output values
- (b) tabulates all its input conditions only
- (c) display all its input/output possibilities
- (d) is not based on logic algebra

(vii) The output of a two inputs OR gate is 0 only when its

- (a) both inputs are 0
- (b) either input is 1
- (c) both inputs are 1
- (d) either input is 0

(viii) A two inputs NAND gate with inputs A and B has an output 0 if

- (a) A is 0
- (b) B is 0
- (c) both A and B are zero
- (d) both A and B are 1

(ix) The truth table shown below is for _____ gate

- (a) XNOR
- (b) OR
- (c) AND
- (d) NAND

A	B	X
0	0	1
0	1	0
1	0	0
1	1	1

- Ans. (i) (c) (ii) (d) (iii) (d) (iv) (a) (v) (b)
- (vi) (c) (vii) (a) (viii) (d) (ix) (a)