

**Department of Electrical Engineering**  
**Assignment**  
**Date: 14/04/2020**

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**Course Details**

**Course Title:** Electronics  
**Instructor:** Engr. Sajid Nawaz

**Module:** 2nd  
**Total Marks:** 30

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**Student Details**

**Name:** Muhammad Abbas

**Student ID:** 16721

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Q1	Electronics components are widely used in the field of communication. Specify those equipment in which electronics components are used and describe the role of electronics in modern world technology.	<b>(10 marks)</b>
Q2	Explain working principal of P-N junction diode in forward and reverse biased condition.	<b>(10 marks)</b>
Q3	Differentiate between the following <ul style="list-style-type: none"><li>➤ Intrinsic Semiconductor.</li><li>➤ Doped Semiconductor.</li><li>➤ Carriers movement.</li></ul>	<b>(10 marks)</b>

Q(1)

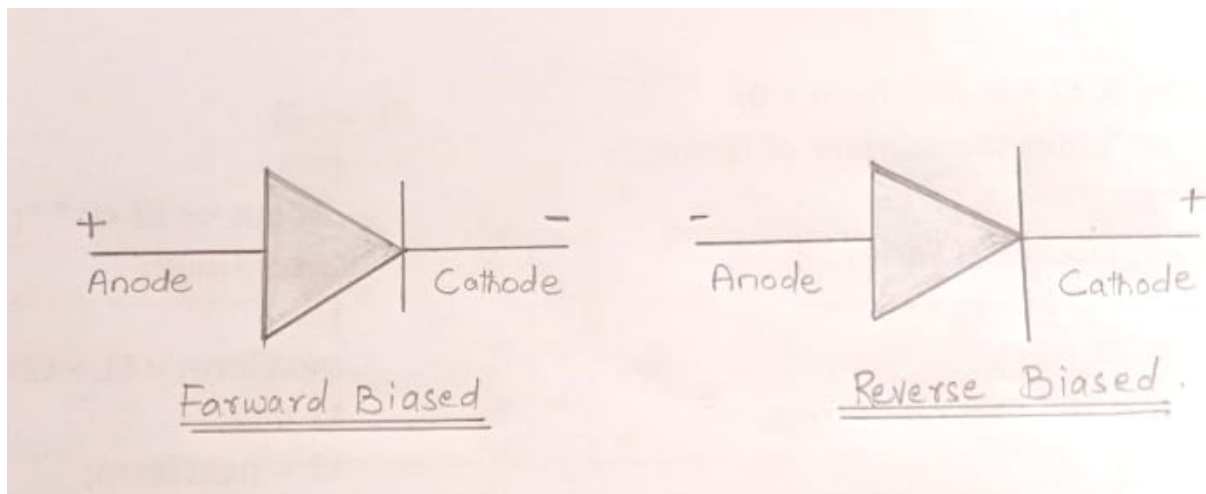
S.No	<u>Semiconductors</u>	<u>Passives</u>	<u>Electromechanical</u>	<u>Power, Circuit Protection</u>
	<ul style="list-style-type: none"> <li>➤ <u>Development Boards, Kits, Programmers</u></li> <li>➤ <u>Discrete</u></li> <li>➤ <u>Embedded Computers</u></li> <li>➤ <u>Integrated Circuits (ICs)</u></li> <li>➤ <u>Isolators</u></li> <li>➤ <u>LED/Optoelectronic s</u></li> <li>➤ <u>RF, Wireless</u></li> <li>➤ <u>Sensors, Transducers</u></li> </ul>	<ul style="list-style-type: none"> <li>➤ <u>Capacitors</u></li> <li>➤ <u>Crystals, Oscillators</u></li> <li>➤ <u>Filters</u></li> <li>➤ <u>Inductors, Coils, Chokes</u></li> <li>➤ <u>Potentiometers, Variable Resistors</u></li> <li>➤ <u>Resistors</u></li> <li>➤ <u>Thermal Management</u></li> </ul>	<ul style="list-style-type: none"> <li>➤ <u>Audio</u></li> <li>➤ <u>Fans</u></li> <li>➤ <u>Motors, Solenoids, Drivers</u></li> <li>➤ <u>Relays</u></li> <li>➤ <u>Switches</u></li> </ul>	<ul style="list-style-type: none"> <li>➤ <u>Battery Products</u></li> <li>➤ <u>Circuit Protection</u></li> <li>➤ <u>Line Protection</u></li> <li>➤ <u>Power Supplies</u></li> <li>➤ <u>Transformers</u></li> </ul>

Today, the use of electronics is so much a part of our everyday lives that we rarely think about what the world would be like without electronics. Everything from cooking to music uses electronics or electronic components in some way. A car has many electronic components, such as our cooking stoves, laptops and cell phones. Kids and teens take mobile devices with them everywhere and use them for texting as well as sending and sending photos, videos, and music. Wireless Internet is becoming ever more common, cybercafe has laptops where people can drink coffee and check their email at the same time. The technology of electronics has increased dramatically in cameras. A digital camera is available to most Americans at a price they can afford, and cell phones often include a very sophisticated digital camera. Thousands of everyday devices that we use on a daily basis use electronics technology to operate.

## Q(2)

### Introduction

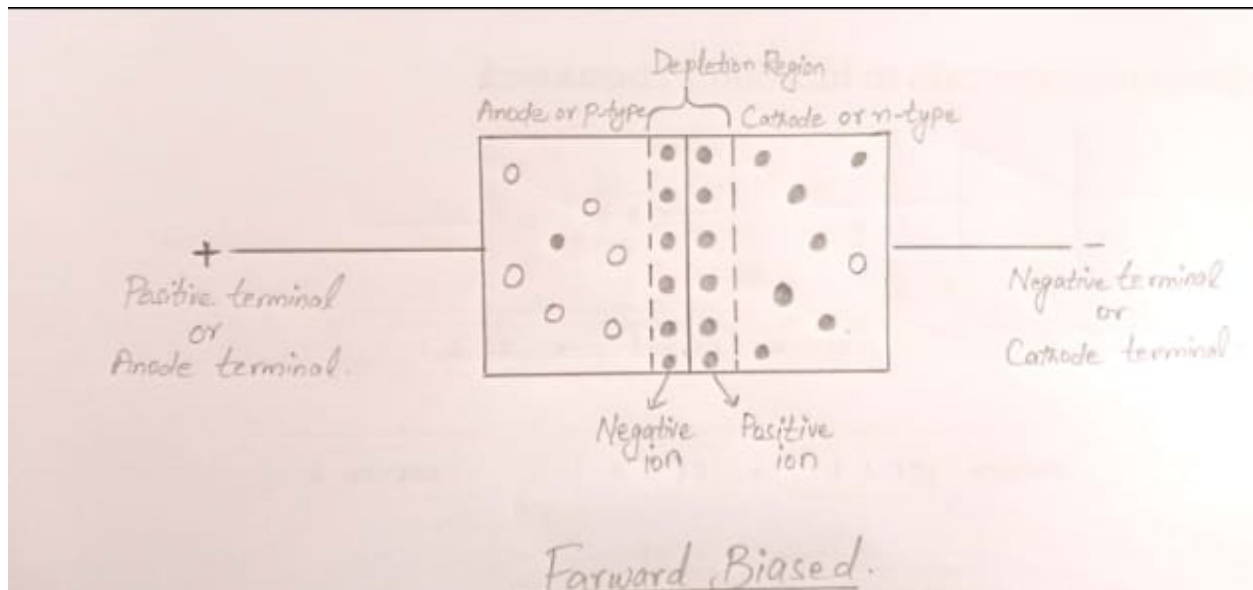
A P-n junction diode is a two-terminal or two-electrode semiconductor device, which allows electric current in only one direction, while stopping the electric current in the opposite or opposite directions. The p-n junction, which is formed upon joining the p-n and n-type semiconductors, is called the p-n junction diode.



### P-N Junction diode under forward bias

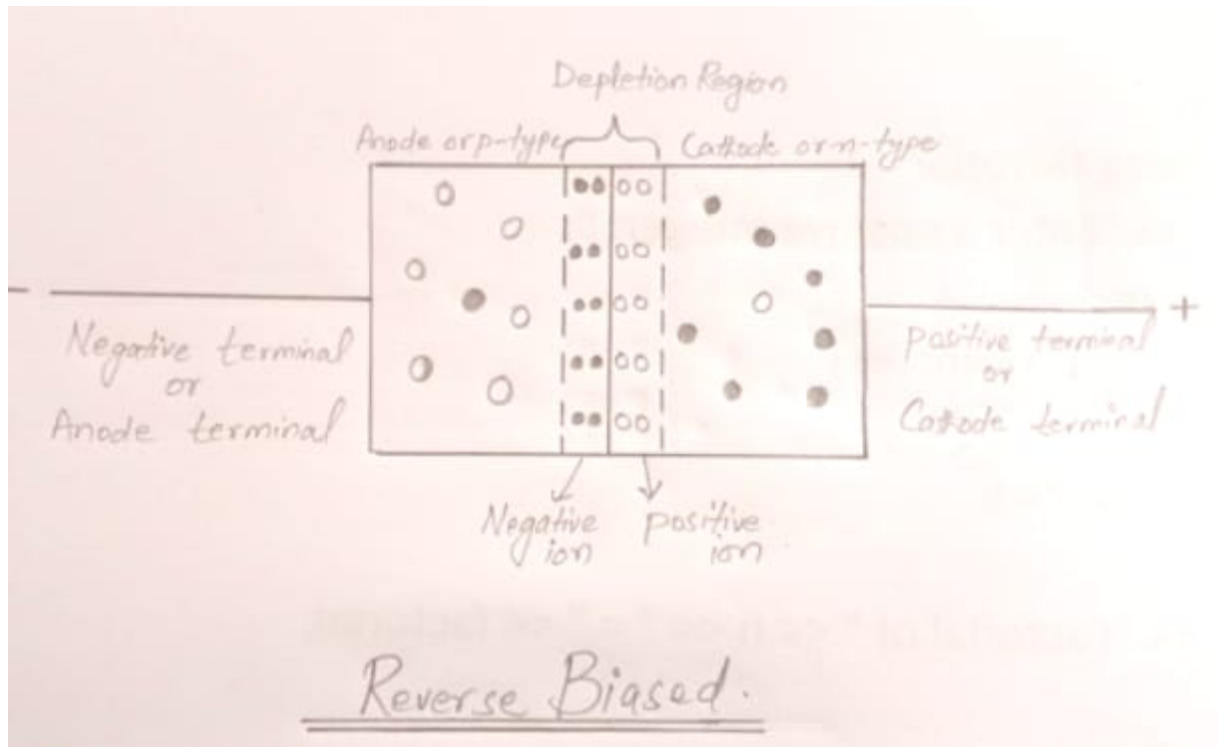
Forward bias p (n) junction diode (connected to a p-type connected terminal and connected to a non-type negative terminal), the Anode terminal is a positive terminal while the cathode terminal is a negative terminal. The Anode terminal is the source of the positive charge carrier (hole), the positive charge carrier (hole) begins its journey from the Anode terminal and travels through the diode and ends at the cathode terminal. The cathode is a negatively charged electrode or conductor, which supplies free electrons to the p-n junction. In other words, the cathode terminal or negative terminal is the source of free electrons, negative charge carriers (free electrons) start their journey

from the cathode terminal and travel through the diode and end at the Anode terminal.



### **P-N Junction diode under reverse bias**

If the diode reverse is biased (p-type is connected to the negative terminal and the n-type is connected to the positive terminal), the Anode terminal becomes a negative terminal while the cathode terminal becomes a positive terminal. Provides free electrons to the Anode terminal or negative terminal p-n junction. Electrons independent of the negative terminal cannot move toward the positive terminal because the wider relaxation area at the p-n junction opposes or opposes the release of free electrons. The cathode terminal or the positive terminal provides holes at the p-n junction. The free electrons in the n-type semiconductor are attracted to the positive terminal. Holes from the positive terminal cannot move toward the negative terminal because the region at the pins n at the p-n junction opposes the flow of holes.



Q(3)

S.No	INTRINSIC SEMICONDUCTORS	Doped Semiconductor	Carrier movement

1	<p>An intrinsic semiconductor is a semiconductor in which no other material is intentionally doped(similar to mixing). Example: Si, Ge. It behaves as an insulator at absolute zero.</p>	<p>Doping is the process of adding impurities to intrinsic semiconductors to alter their properties. Normally Trivalent and Pentavalent elements are used to dope Silicon and Germanium.</p>	<p>Carrier movement is the process of movement of charge carriers due to concentration gradient along the semiconductor</p>
2	<p>Electrons are excited by thermal energy.</p>	<p>When an intrinsic semiconductor is doped with Trivalent impurity it becomes a P-Type semiconductor. The P stands for Positive,</p>	<p>In a p-n junction, n-side has excess of electrons and hence electrons diffuse from n-side to p-side. Similarly, holes diffuse from p-side to n-side.</p>
3	<p>They are different from pure semiconductors and may consist of some level of impurities. The conductivity of intrinsic</p>	<p>which means the semiconductor is rich in holes or Positive charged ions. When we dope intrinsic material with Pentavalent</p>	<p>Carriers move freely about the semiconductor lattice in a random direction at a certain velocity determined by the</p>

	<p>semiconductor is more than that of a pure semiconductor as the impurities provide a few energy levels in the band gap.</p>	<p>impurities we get N-Type semiconductor, where N stands for</p>	<p>temperature and the mass of the carrier.</p> <p>Carriers will continue in that direction until they collide with another semiconductor lattice atom.</p>
4	<p>Note: Pure semiconductors are semiconductors that have no impurities. Ideally, no semiconductor is pure in nature.</p>	<p>Negative. N-type semiconductors have Negative charged ions or in other words have excess electrons in it.</p>	<p>There is no net overall movement of carriers in any direction.</p>