

Fundamentals of Electronics Devices

Unit-3

Lecture-3

Biased junctions

- One useful feature of a p-n junction is that current flows quite freely in the p to n direction when the p region has a positive external voltage bias relative to n (forward bias and forward current), whereas virtually no current flows when p is made negative relative to n (reverse bias and reverse current).

Introduction

- This asymmetry of the current flow makes the p-n junction diode very useful as a *rectifier*.
- While rectification is an important application, it is only the beginning of a host of uses for the biased junction.
- Biased p-n junctions can be used as voltage-variable capacitors, photocells, light emitters, and many more devices which are basic to modern electronics.

- In this lecture we begin with a qualitative description of current flow in a biased junction.
- With the background of the previous lecture, the basic features of current flow are relatively simple to understand, and these qualitative concepts form the basis for the analytical description of forward and reverse currents in a junction.

Qualitative description of Current Flow at a Junction

- We assume that an applied voltage bias V appears across the transition region of the junction rather than in the neutral n and p regions.
- Of course, there will be some voltage drop in the neutral material, if a current flows through it.

- But in most p-n junction devices, the length of each region is small compared with its area, and doping is usually moderate to heavy; thus the resistance is small in each neutral region, and only a small voltage drop can be maintained outside the space charge (transition) region.
- For almost all calculations it is valid to assume that an applied voltage appears entirely across the transition region.