ROHINI
COLLEGE OF ENGINEERING & TECHNOLOGY
Approved by AICTE and Affiliated to Anna University, (An ISO Certified Institution)
Near Anjugramam Junction, Kanyakumari Main Road, Palkulam, Variyoor P.O - 629 401

DEPARTMENT OF BIOMEDICAL ENGINEERING

III Semester- BM3301 SENSORS AND MEASUREMENTS

UNIT - 3

3.8 Comparison of Photoelectric Transducers

Photoelectric transducers, also known as photodetectors, are devices that convert light energy into electrical signals. There are several types of photoelectric transducers, each with its own characteristics and applications. Here's a comparison of some common types:

Photovoltaic Cells:

- Principle: Converts light energy directly into electrical energy through the photovoltaic effect.

Characteristics:

- Simple and robust.
- Suitable for low-light conditions.
- Slow response time.
- Used in solar cells for power generation.

Photodiodes:

- Principle: Generates a photocurrent when exposed to light.

Characteristics:

- Fast response time.
- High sensitivity.
- Lower noise compared to phototransistors.
- Commonly used in various applications, including communication systems and light sensors.
- **Phototransistors:**
- Principle: Similar to photodiodes, but with additional amplification through a transistor.
- **Characteristics:**
- Higher sensitivity than photodiodes.

- Slower response time compared to photodiodes.
- Amplification allows for higher gain.
- Used in applications where higher sensitivity is required.

Phototubes (Photomultiplier Tubes):

Principle: Uses a series of dynodes to multiply the number of electrons produced by incident photons.

Characteristics:

- Extremely high sensitivity.
- Wide spectral response.
- Fast response time.

Used in low-light-level applications such as fluorescence detection.

Photoresistors (LDR - Light Dependent Resistor):

Principle: Changes resistance based on the intensity of light.

Characteristics:

- Simple and low cost.
- Slow response time.
- Suited for applications with varying light conditions, like in streetlights or camera exposure control.

Avalanche Photodiodes (APDs):

Principle: Operates based on the avalanche multiplication of carriers.

Characteristics:

- High sensitivity and gain.
- Faster response than standard photodiodes.
- Used in applications requiring higher sensitivity, such as optical communication.

Charge-Coupled Devices (CCDs):

Principle: Converts photons into electrical charge, which is then shifted across the device for readout.

Characteristics:

- High resolution and sensitivity.
- Used in imaging applications like digital cameras and scientific instruments.
- When choosing a photoelectric transducer, considerations include the application requirements such as sensitivity, response time, spectral range, and cost. The appropriate transducer depends on the specific needs of the system or device in which it will be employed.