

ELECTRONIC MEASUREMENT & INSTRUMENTATION (BEC-29)



Instructor
Dr. B. P. Pandey
Assistant Professor

**Department of Electronics and Communication Engineering
Madan Mohan Malaviya University of Technology , Gorakhpur**

August, 2020

UNIT- 2
Lecture-8
Transducers

CONTENTS

Lecture 1:

- Introduction
- Selection Parameters of Transducer

Lecture 2:

- Resistive Transducer

Lecture 3:

- Strain Gauges

Lecture 4 & 5:

- Inductive Transducer
- Differential Output Transducers
- LVDT

Lecture 6:

- Capacitive Transducer

Lecture 7:

- Photo-electric Transducer
- Photo cells

Lecture 8:

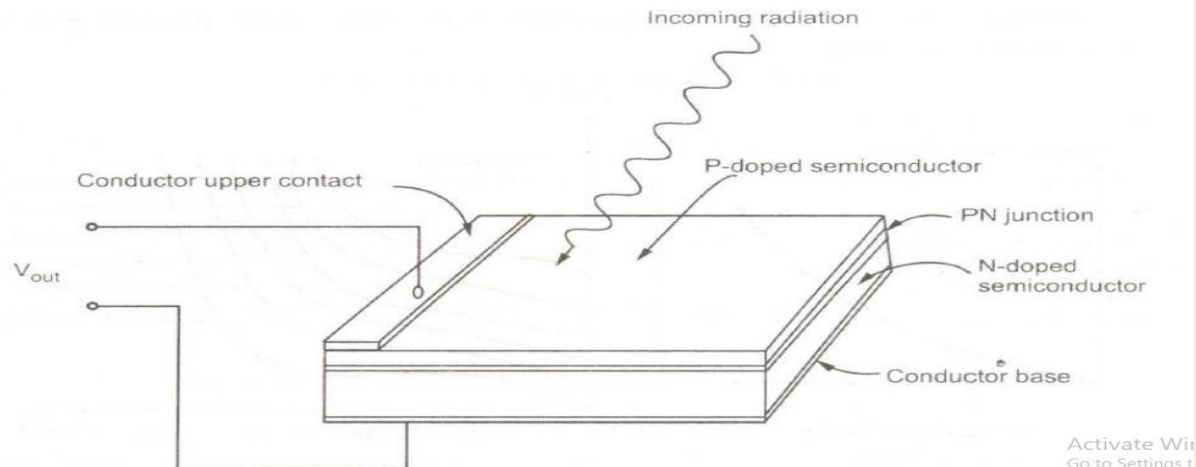
- Photo-Voltaic Cell
- Photo Transistors

Lecture 9:

- Temperature Transducers
- Mechanical Transducer

Photo-Voltaic Cell

- Fig shows the typical structure of photovoltaic cell.
- It shows that cell is actually a PN-junction diode with appropriately doped semiconductors.
- When photons strike on the thin p-doped upper layer, they are absorbed by the electrons in the n-layer; which causes formation of conduction electrons and holes.
- These conduction electrons and holes are separated by depletion region potential of the pn junction.
- When load is connected across the cell, the depletion region potential causes the photocurrent to flow through the load.

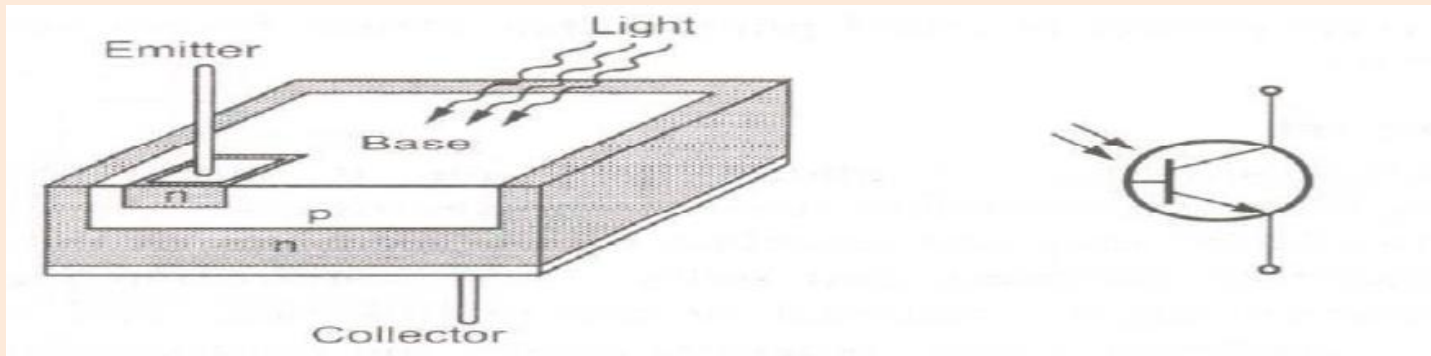


Phototransistors

- The photo transistor has a light sensitive collector to base junction. A lens is used in a transistor package to expose base to an incident light. When no light is incident, a small leakage current flows from collector to emitter called I_{eEO} , due to small thermal generation. This is very small current, of the order of nA. This is called a **dark current**.
- When the base is exposed to the light, the base current is produced which is proportional to the light intensity. Such photo induced base current is denoted as I_b ...The resulting collector current is given by,

$$I_C \approx h_{fe} I_b$$

- The structure of a phototransistor is shown in the Fig. while the symbol is shown in the Fig.



Assignment Questions

- Explain in brief the working of solar cell. State its applications.
- Explain the operation of a photodiode and phototransistor.
- State the advantages of Phototransistors.
- List the drawbacks of photodiode.

Conceptual Questions

- When the source of light is not sun light then the photo voltaic cell is used as _____
 - a) Photo diode
 - b) Photo voltaic cell
 - c) Photo detector
 - d) Photo transmitter
- The region where the electrons and holes diffused across the junction is called _____
 - a) Depletion Junction
 - b) Depletion region
 - c) Depletion space
 - d) Depletion boundary

Contd..

- The current produce by the solar cell can be given by _____
 - a) $I_L - I_D + I_{Sh}$
 - b) $I_L + I_D - I_{Sh}$
 - c) $I_L + I_D + I_{Sh}$
 - d) $I_L - I_D - I_{sh}$
- The amount of photo generated current increases slightly with an increase in _____
 - a) Temperature
 - b) Photons
 - c) Diode current
 - d) Shunt current
- _____ is one of the most important materials is also known as solar grade silicon.
 - a) Crushed silicon
 - b) Crystalline silicon
 - c) Powdered silicon
 - d) Silicon

Contd..

- _____ photo voltaic devices in the form of thin films.
 - a) Cadmium Telluroide
 - b) Cadmium oxide
 - c) Cadmium sulphide
 - d) Cadmium sulphate
- . _____ is a direct band gap material.
 - a) Copper Indium Gallium Selenide
 - b) Copper Selenide
 - c) Copper Gallium Telluride
 - d) Copper Indium Gallium Diselenide

Contd..

- Quantum dot solar cells are based on _____
 - a) Gratzel cell
 - b) Solar cell
 - c) Voltaic cell
 - d) Galvanic cell
- . The quantum dot used are _____
 - a) Cds
 - b) CdTe
 - c) PbO
 - d) GaAs

THANK YOU