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Internal Assesment Test – 1				
Sub: Mechatronics				Code: 18ME744
Date:21/10/2022	Duration: 90 mins	Max Marks: 50	Sem: 8 A & B	Branch (sections): ME

Answer all FIVE questions.

		Marks	OBE	
			CO	RBT
1	Define transducer and classify it. Sketch and explain capacitive transducer.	[10]	CO2	L2
2	What is Hall Effect? Explain the Hall Effect with neat sketch.	[10]	CO2	L2
3	What is a microprocessor? List out any four differences between Microcontroller and Microprocessor.	[10]	CO3	L2
4	Explain (i) Light sensors (ii) LVDT	[10]	CO2	L2
5	With a block diagram, explain multidisciplinary scenario in Mechatronics.	[10]	CO1	L2

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1. Definition and Classification of Transducer:

A Transducer is a device which transforms one form of physical phenomenon or energy to another form for varies purposes including measurement, control and information transfer. The physical phenomenon may be position, displacement, force, torque, flow of fluid, pressure of fluid, temperature, etc..

Transduce= Trance (Change) + Induce (Provide)

Classification of Transducer:

Transducers are classified based on the following factors:

a. Whether the device senses and converts or just converts physical phenomenon.

b. Method of conversion of energy.

c. Nature and Type of output signals.

d. Type of sensing element used.

e. Type and nature of measurand to be used.

f. Whether they are self generating or externally powered.

g. Its purpose in the measurement system.

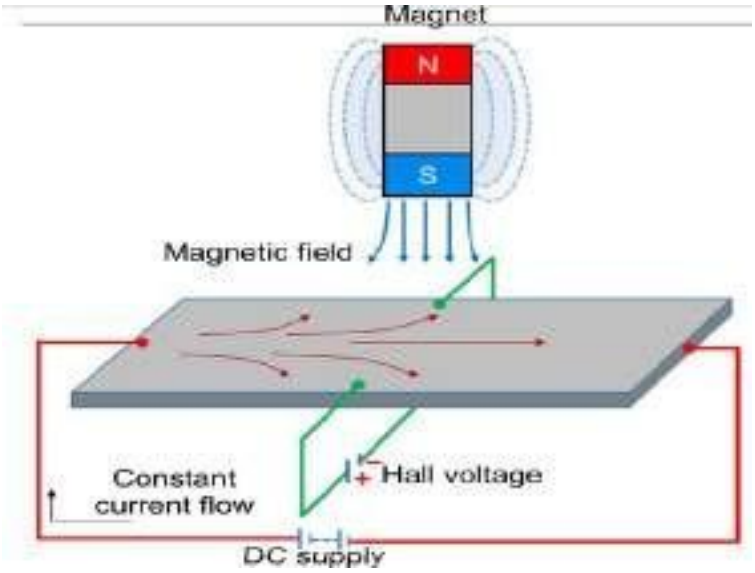
2. Hall Effect Sensors:

Hall Effect sensors work on the principle that when a beam of charge particles passes through a magnetic field, forces act on the particles and the current beam is deflected from its straight line path. Thus one side of the disc will become negatively charged and the other side will be of positive charge. This charge separation generates a potential difference which is the measure of distance of magnetic field from the disc carrying current.

The typical application of Hall Effect sensor is the measurement of fluid level in a container. The container comprises of a float with a permanent magnet attached at its top. An electric circuit with a current carrying disc is mounted in the casing. When the fluid level increases, the magnet will come close to the disc and a potential difference generates.

This voltage triggers a switch to stop the fluid to come inside the container.

These sensors are used for the measurement of displacement and the detection of position of an object. Hall Effect sensors need necessary signal conditioning circuitry. They can be operated at 100 kHz. Their non-contact nature of operation, good immunity to environment contaminants and ability to sustain in severe conditions make them quite popular in industrial automation.



3. It is a multi-purpose, programmable device that reads binary instructions from a storage device called memory, processes the data according to the instructions, and then provides results as output. In common practice it is also known as CPU (central processing unit). CPU can be referred as complete computational engine on a single chip.

Microcontroller	**Microprocessor**
Micro Controller is a heart of theembedded system	The microprocessor is the heart ofComputer system
Microcontroller has an external processor along with internal memory and input/output components	It is just a processor. Memory and I/O components have to be connectedexternally
Since memory and I/O are presentinternally, the circuit is small.	Since memory and I/O has to be connected externally, the circuit becomes large

The cost of the entire system is low	Cost of the entire system increases
The microcontroller has a number ofregisters, hence the programs are easier to write	Microprocessor has less number of registers, hence more operations are memory based
Used mainly in the washing machine,MP3 players	Mainly used in personal computers

4. Light sensors:

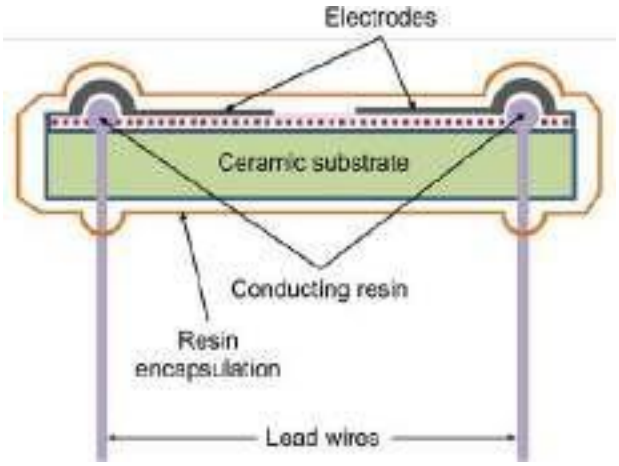
Principle of Working and Applications of Light Sensors:

A light sensor is a device that is used to detect light. There are different types of light sensorssuch as photocell/ photo resistor and photo diodes being used in manufacturing and other industrial applications.

Photo resistor is also called as light dependent resistor (LDR). It has a resistor whose resistance decreases with increasing incident light intensity. It is made of a high resistance semiconductor material, cadmium sulfide (CdS). The resistance of a CdS photo resistor varies inversely to the amount of light incident upon it. Photo resistor follows the principle of photoconductivity which results from the generation of mobile carriers when photons are absorbed by the semiconductor material.

Figure shows the construction of a photo resistor. The CdS resistor coil is mounted on a ceramic substrate. This assembly is encapsulated by a resin material. The sensitive coil electrodes are connected to the control system though lead wires. On incidence of high intensity light on the electrodes, the resistance of resistor coil decreases which will be used further to generate the appropriate signal by the microprocessor via lead wires.

Photo resistors are used in science and in almost any branch of industry for control, safety, amusement, sound reproduction, inspection and measurement.



5. Definition 1:

Mechatronics may be defined as" the complete integration of mechanical systemwith electronics, electrical and computer system into a single system".

Definition 2:

Mechatronics is "the synergistic (Together) combination of mechanical engineering, electronic engineering, control engineering and systems thinking in the design of products and manufacturing processes"

Example: automatic washing machine, digital fuel injection system, engine managementsystem.

Etc.,

Multi-disciplinary scenario:

- Mechatronics is the synergistic (Together) combination of mechanical engineering, electronic engineering, control engineering and systems thinking in the design of products and manufacturing processes".
- Multi-disciplinary products are not new; they have been successfully designed and used for many years. Most common is the electromechanical system.
- It employs a sequential design-by-discipline approach. For example in the design of electromechanical system three stages of design are adopted.
- They are design of mechanical system, design of microelectronic system and control system.
- Each design application follows the completion of the previous one.
- To overcome drawbacks Mechatronics uses concurrent engineering.

6.