

Question 1

i A sensor is a machine, device or module whose purpose is to detect circuit in its environment and send the information to other electronics.

Examples:

- a Accelerator
- b Light sensor
- c IR sensor
- d Pressure sensor
- e Proximity sensor

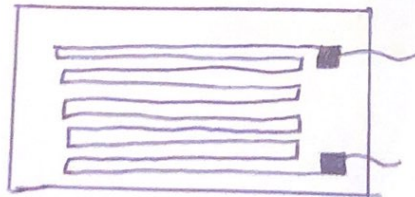
ii An actuator is a component of a machine which is responsible for moving and controlling the system. This device requires a control signal and a source of energy.

Examples:

- a Hydraulic cylinder
- b Electronic motor
- c Comb drive
- d Electroactive Polymer
- e Digital Micro device.

Question 2

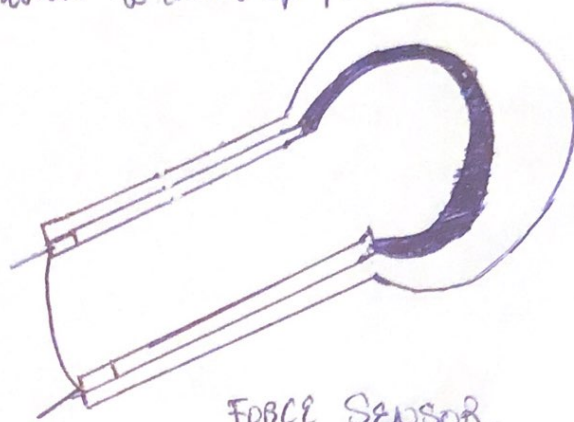
2a Strain Gauge: This is a device which is used to measure strain on an object. The most common type of this device consists of an insulating flexible backing which supports a metallic foil pattern.



Strain Gauge

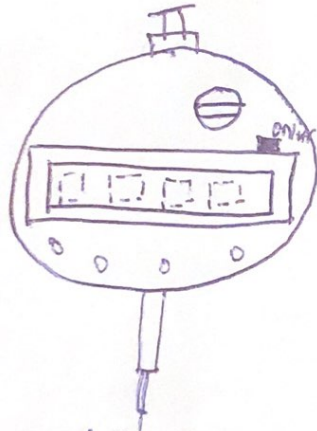
181216, 02/10/27

20 Force Sensor: This device weighs freight on manufacturing and transportation equipment. The device also monitors loads on machines subject to stringent safety standards such as mine lifts, construction cranes, grain silos and locomotives to ensure equipment is not overloaded.



21 Digital Indicator:

These are flexible devices which can be used in many different fields such as industry and research as well as a wide variety of measurement works. They also allow the user to view diverse parameters such as temperature, humidity, vibration etc.





### 3a. Germicidal Light To Reduce The Risk Of Pneumonia Associated With Endotracheal And Tracheostomy Tubes:

Endotracheal and Tracheostomy tubes are used to provide an airway in patients who do not have an adequate airway due to medical conditions. Both tubes incorporate an inflatable cuff to secure the tube and prevent aspirations of oral secretions and other contaminants into the lungs.

A consequence of the inflated cuff is that undesired bacteria may colonize around the top of the cuff. Aspiration of these bacteria is a leading cause of ventilator-associated pneumonia.

The Rife Endotracheal Tube incorporates a germicidal light adjacent to the cuff, activation of the germicidal light source causes a radiation emission that kills the undesired bacteria and may reduce the need for administration of antibiotics.

### 3b. A Compact High Pressure Hydrogen Pump:

Proton Exchange Membrane (PEM) fuel cells are being developed as an alternative method for powering automobiles. PEM fuel cells produce AC electrical power which can be used to power electric drive systems in hybrid cars to charge the main battery pack. The PEM fuel cells require a rugged, high performance fuel pump to deliver the hydrogen to the fuel cells in order for them to produce electricity. The pump, and associated motor electronics, must endure extremes in

### 3b. An Endoscopic Tool For The Treatment Of Obesity:

Obesity is a problem that affects roughly 40 million people in the United States. In this process, it is clear that there are some basic unanswered questions about the behaviour of the stomach tissues when subjected to various events such as suturing and gripping via suction. In this testing process we designed simple surrogates that mimicked concepts that we had developed. These surrogate test components were manufactured. Both stereolithography and selective Laser Sintering (SLS) were used to manufacture these surrogates. The result was that we were able to quickly test many potential design configurations and downselect promising approaches.