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DEPT :- COMP. ENGINEERING

1 B

1 Describe briefly (with examples) Sensors and Actuators for Biomedical Applications.

Answer -

Biomedical sensors are the product of the integration of electronic information technology and biomedicine, and they have a strong vitality with the development of multidisciplinary interactions. Biomedical sensors are special electronic devices that can transduce biomedical signals into easily measurable electric signals. Biomedical sensors are the key component in various medical diagnostic instruments and equipment. Biomedical sensors are usually classified according to the quantity to be measured and are typically categorised as physical, electrical, or chemical, depending on their specific application.

Applications.

- Hydrogel based sensors
- Fiber optic sensors

- Silicon based ~~SOA~~ sensors
- Electrochemical sensor

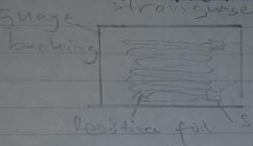
Actuators:
Actuators are mechanical or electromechanical devices that provide controlled and sometimes limited movements or positioning which are operated electrically, manually or by various fluids such as air hydraulic. Two basic motions are linear and rotary. Linear actuators ~~re~~ convert energy into straight line motion, typically for positioning applications, and usually have a push and pull function. Some linear actuators are unpowered and manually operated by use of a rotating knob or handwheel.

Applications:
- Electroactive smart polymers
- Superparamagnetic twisty type actuators

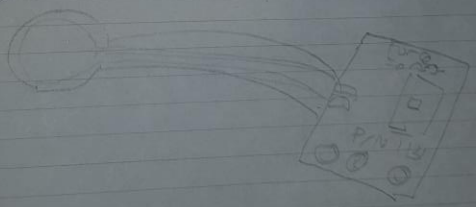
② Describe with sketches and examples, of the components of a basic measuring instrument

Answer

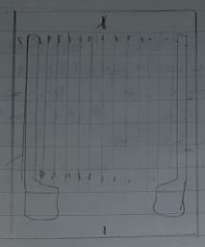
a) Strain gauge
A strain gauge is a sensor whose resistance varies with applied force. It converts force, pressure, tension, weight etc. into a change in electrical resistance which can be measured



b) force sensor - force sensors use load cells to weight objects and prevent machinery from over-loading. 3 main types - tensile, compression sensors.

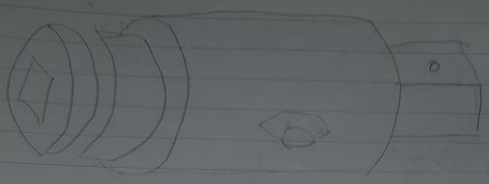


c) Load cell - load cell is a force transducer. It converts a force such as tension, compression, pressure or torque into an electrical signal that can be measured and standardized



d Pressure sensor - It is a device for pressure measurement of gases or liquids.

€ Torque ~~se~~ Transducer
A Torque sensor is a transducer that converts a torsional mechanical input into an electrical output signal



3 Describe Briefly 2 case studies of medical measurement instruments

a Thermometer - Thermometer is a device used to measure the body temperature. Temperature measurement. It can measure the temperature of a solid such as food, a liquid such as water or a gas such as air. The three most common units of measurement for temperature are Celsius, fahrenheit and kelvin. Thermometer is a tool that measure temperature.

b Weight Scale. It is a measuring instrument for determining the weight or mass of an object. In simple terms, a balance measure mass, while scale measure weight. A scale displays weight by measuring a deflection, the springs are deformed by the load, the force needed to deform the spring is measure and converted into weight.