

18/ENG04/008

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Assignment

Question 1

A sensor is a device, module, machine, or subsystem whose purpose is to detect events or changes in its environment and send the information to other electronics, frequently a computer processor.

An actuator is a component of a machine that is responsible for moving and controlling a mechanism or system, for example by opening a valve. An actuator requires a control signal and a source of energy.

Sensors for Biomedical Applications

Sensors used for biomedical applications are used to gain information on body and pathology which is a branch of biomedical engineering.

Sensors for biomedical applications are classified into three. They are:

1) Physical sensors: They could be employed to measure blood pressure, body temperature, blood flux, blood viscosity, biological magnetic field etc.

2) Chemical sensor: They are utilized to detect the ingredient and concentration of the body liquid such as pH value, Ca^{+} concentration, glucose concentration etc.

3) Biosensor: They are used to sense enzyme, antigen, antibody, hormone, DNA, RNA and microbe.

In nature, biosensor is a kind of chemical sensor which is mainly used to detect biological signals.

Actuators for biomedical applications.

Biomedical actuators are known for their accuracy and control. The following are examples of actuators for biomedical applications.

- 1) Scanners: CT, MRI and PT scanning instruments are used in the hospitals, clinics and palliative care units for examination and diagnosis purposes. These scanners are powered by linear actuators which allow easy movement in any direction.
- 2) Dental chairs: Dental chairs are the most important features of a dental clinic. These chairs are known for their ergonomics and precision. They are equipped with actuators that allow easy adjustment of footrest, headrest and chair height.
- 3) Laser Positioning Equipment: Today, Laser surgery is becoming popular due to various health benefits that it offers. Also various types of laser equipments are gaining popularity. The laser equipments need to be positioned appropriately for desired results. The laser beam is directed into the injured or to be examined areas as part of treatment. The beam may cause harm to the human body, if factors like position, accuracy and stability are not properly controlled. Linear actuators help control the accuracy and positioning of the beam in the laser positioning equipment.

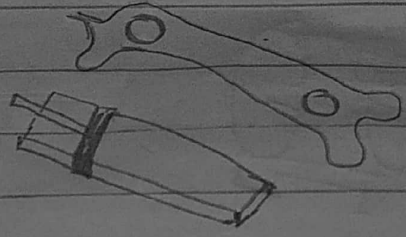
Question 2,

Components of a basic measuring instrument

includes:

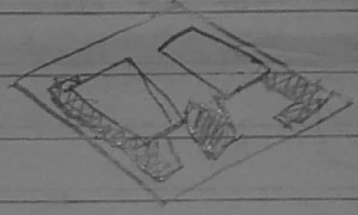
1. Force sensors The force sensors for mass production

most use strain gages



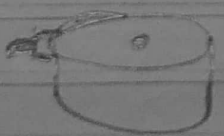
2. Strain gages

Strain gages consist of a very fine metallic foil etched in a grid pattern, which is bonded to a device and used to measure the strain or amount of deformation of the device when weight or pressure is applied.



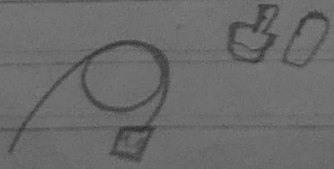
3. Load cells

Load cells are used to convert weight into electrical output



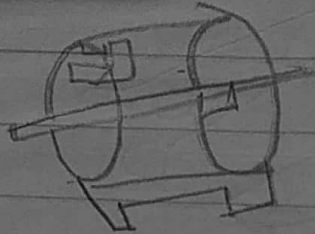
4. Pressure Sensors

Pressure sensors are sensors that measure pressure and electrical signals



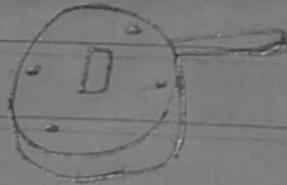
5 Torque transducers

These sensors for torque measurement measures the twist with a strain gage in various driving parts like the engine and the transmission etc



6. Vector sensors

The vector sensor is a sensor that detects the translation power in three directions. The sensor can miniaturize because of a simple structure and is the best for the usage of the gripping force detection.



7 Digital indicators

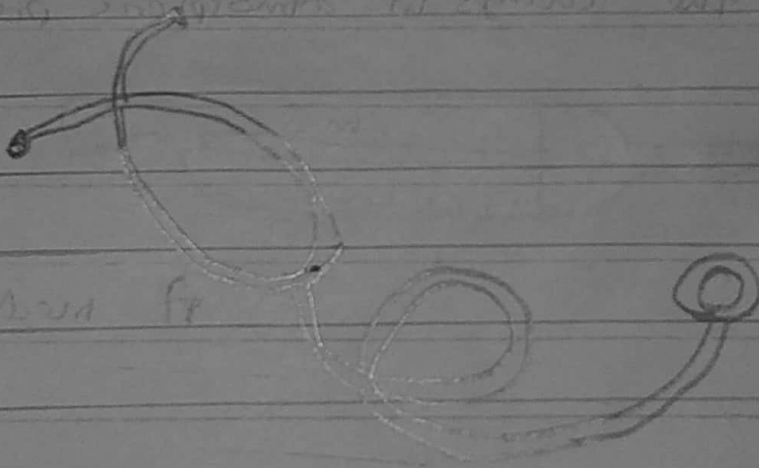
These devices are connected to various sensors and transducers, display measured values digitally and output signals used for control and monitoring of the working systems



Question 3

Q) Stethoscope

This is an acoustic medical device for auscultation, or listening to internal sounds of an animal or human body. It typically has a small disc shaped resonator that is placed against the skin, and one or two tubes connected to two earpieces. A stethoscope can be used to listen to the sounds made by the heart, lungs or intestines, as well as blood flow in arteries and veins. In combination with a manual sphygmomanometer, it is commonly used for measuring blood pressure.



A Stethoscope.

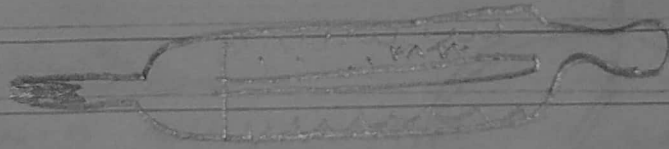
2) A medical thermometer.

This is used for measuring human or animal body temperature. The top of the thermometer is inserted into the mouth under the tongue, under the armpit, into the rectum via the anus, into the ear, or into the forehead.

Purpose

- It measures the body temperature.

The medical thermometer began as an instrument more appropriately called the water-thermoscope, constructed by Galileo Galilei circa 1592-1593. It lacked an accurate scale to measure temperature and could be affected by the changes in atmospheric pressure.



A medical thermometer.