JOHN-UGWU NNEOMA FAVOUR
18/ENG02/052
COMPUTER ENGINEERING
EEE 319

ANSWERS

1. The following are sensors and actuators for Biomedical Applications with example.

Sensors used in biomedical applications sensors are widely used in biomedical applications. Measuring patients vitals are now very quick, easy, fast, accurate because of advancements of electrical appliance.

(i) Physical sensor: in this case quantities such as geometric mechanical, thermal and hydraulic variables are measured. In biomedical application these variables are muscle displacement, blood pressure, bone growth velocity

Two types of physical sensors with regard to their biomedical application (a) sensors of electrical phenomena in the body, usually known as electrodes used in diagnostic therapeutic applications.

(b) The other type as used to utilize light to collect information which is known as optical sensor.

(ii) Chemical sensor: are concerned with the chemical quantities such as identifying the presence of chemical composite detecting the concentration of various chemical species and monitoring the chemical activities in the body for diagnostic and therapeutic application examples are gas, photometric, electrochemical etc.

(iii) Biosensors used for scanning and detection of information in the body. examples are Antibody, antigen, enzyme, cell, DNA etc.

Continuation of no 1

Actuator, in biomedical applications uses energy to provide motion such as microactuators used to produce complex microsystems capable of controlling many parameters.

(i) Micromanipulators actuator which are driven by a microactuation mechanism capable of operating the system good examples includes, magnetic, pneumatic, thermal actuator. which are termed as electroactive polymer actuators.

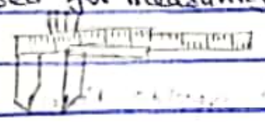
(ii). Surgical Microinstrument actuated by shape-memory alloy forces by employing high-force small displacement stepper motors which are driven by a piezoceramic actuator. Conjugated polymer actuators are used clearly for diagnostic, surgical and therapeutic biomedical systems with this many efforts are made to develop viable reliable low-cost high-precision like microneedles, microfilters, microvalves and micropumps for biomedical applications.

2. The components of a basic measuring instrument

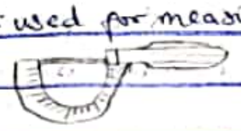
Basic measuring instruments are used to measure physical quantities which are divided into parts.

* Mechanical measuring quantities. eg's are.

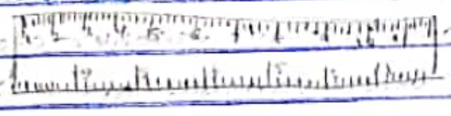
(i). Calipers: used for measuring the distance of two sides of an object



(ii) Micrometer: used for measuring round object to get its thickness.



(iii) Steel scale used to measure length in one dimension



(iv) Dial Gauge: used in measuring deak clearances and thrust.

* Electrical measuring instruments which are) Ammeter, Voltmeter and wattmeter used for measuring current, voltage and power respectively. This instrument always constitutes of its scale and a pointer.

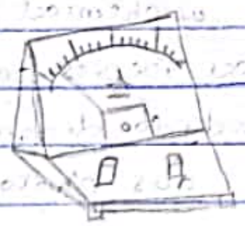


Diagram of an Ammeter

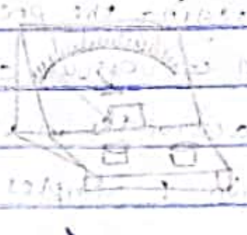


Diagram of a Voltmeter

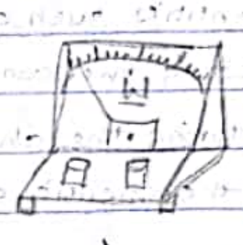


Diagram of a wattmeter

Some other measuring instruments include Seismometer, Light meter, Theodolite, spectrometer etc.

* measurement consists of two parts (i) numeric measure and (ii) the unit that the measurement represents.

3. Using a case study explain two medical instruments used in the hospital

(a) Clinical thermometer, the temperature measuring instrument in hospital measuring a patient's temperature is usually the first process taken after the arrival of the patient's in order to know the body temperature of a person it has different ways of inserting the tip to any parts of a human body to measure the body temperature but in most cases under the armpit insertion is usually advised. After the temperature is taken the nurse is advised to record it in his/her patient's record before proceeding to any other of business in the hospital, with this way it's helps in guiding the doctor in his prescription of treatment of the patient.

(b) Stethoscope used for measuring heart beat / blood pressure

Using a stethoscope when a patient comes into a hospital and he/she tells the doctor's that he/she is having difficulty in breathing or congestion of the lungs. The doctor can listen to his/her lungs for the signs So therefore a stethoscope is a unique device to hear heart sound and to check the lungs too. These checks are called "AUSCULTATIONS". The doctor may also examine the patient's veins in his/her neck and also check for fluid buildup in his/her abdomen and legs to get clarified on the proper and right treatment to be administered to the patient. A stethoscope allows a doctor / physician to listen to the following five types of sounds generated by the heart and blood flowing Through it these are (i) Heart sounds (ii) Murmurs (iii) Clicks (iv) Rubs and (v) Galloping heart rhythm which indicates heart muscle dysfunction or that the muscle of a patient is being overworked.