24/12/20

Nwaohiri Emmanuel Chukwuemeka
Electrical/Electronics
18/eng04/054

EEE 319

Biomedical sensors take signals representing biomedical variables and usually convert them into an electrical or optical signal. As such, the biomedical sensor serve as interface between a biological and an electrical system.

~~Exampte~~
Examples of Biomedical sensors

EMG Sensor

- Known as Electromyography (EMG), it is a method to evaluate motor unit action potential activity in a muscle region.
- As electrical signals travel through nerves to neuromuscular junctions, the change in electrical potentials (voltage) can be measured.
- Some current examples of the EMG sensors being used today are in VR and prosthetic arms

GSR Sensor

- Known as galvanic skin response (GSR), it refers to changes in sweat gland activity that are reflective of the intensity of our emotional state, otherwise known as emotional arousal.
- Skin conductance offers direct insights into autonomous emotional regulation as it is not under conscious control.
- For example, if you are scared, happy agitated or any emotional related response, we will experience an increase in eccrine sweat gland activity which the sensor can pick up through the electrodes and transmit to the master device.

Heart Rate Sensor

- Also known as a heart rate monitor, it is a personal monitoring device that allows a user to track and display his heart rate in real time or for studies purposes.

Actuators for Biomedical Applications

An actuator is a componet of a machine that is responsible for moving and controlling a mechanism or system, for example by opening

Examples of Actuators

Prosthetic arm

Bionic arms work by picking up signals from a user's muscles.

Tonometer

This device is used to measure the pressure of the fluids inside the eyeball. A tonometer measures the pressure of the eye by very gently touching the cornea

2) Basic Measuring Instrument

Voltmeter

Voltmeter is a measuring instrument which measures the voltage across any two points of an electric circuit

Types

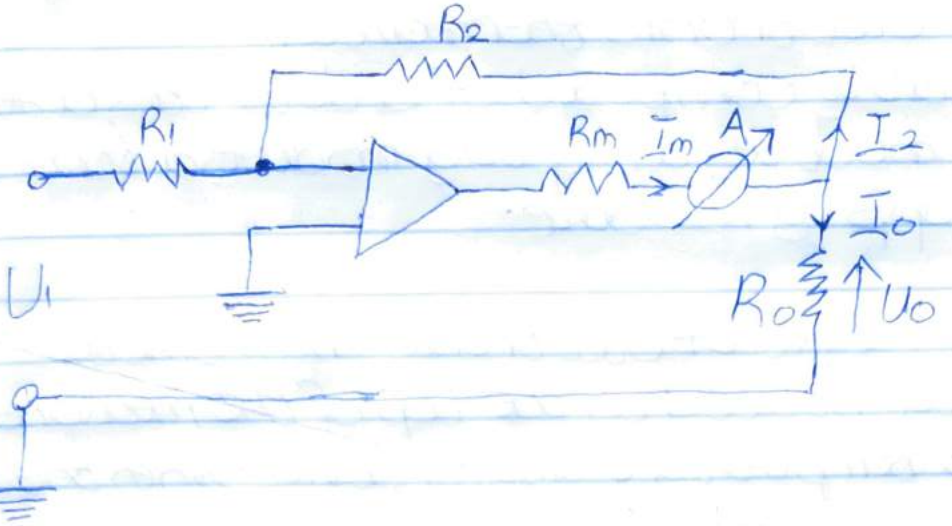
DC Voltmeter

As the name suggests, DC voltmeter measures the DC voltage across any two points of an electric circuit

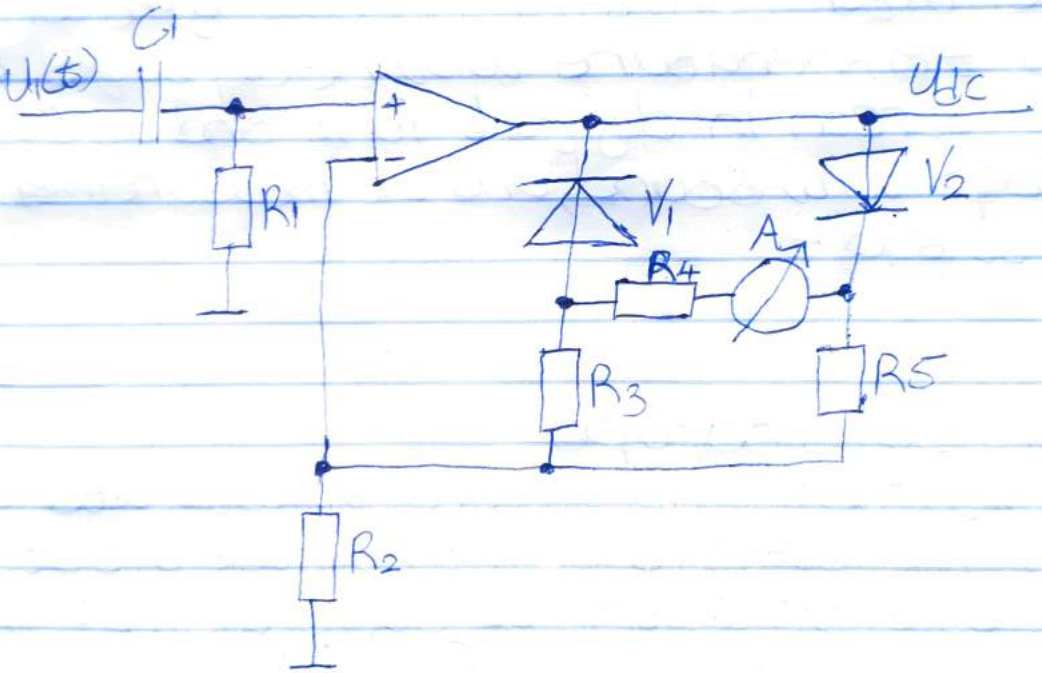
AC Voltmeter

AC Voltmeter measures the AC Voltage across any two points of an electric circuit.

DC Voltmeter Structure



AC Voltmeter structure



3a) Electronic thermometer

Structure of electronic thermometer

It is generally composed of a detector, a sensor, a CPU control module, a display module, a tone module and a power supply module.

Working principle of electronic thermometer

The thermistor placed on the top of the measurement part is used as a temperature sensing device. When the temperature of the measured heat source changes, the resistance of the thermistor will change accordingly. The resistance of the thermistor in the measurement circuit by the internal microprocessor after the value changes, after conversion, processing and correction, the measured temperature will be displayed on the display screen in digital form, and at the same time, the beep will sound, and the measurement process will end.

b) ElectroCardiograph

Electrocardiograph machines are typically used on patients who have suffered heart damage, are at risk for heart disease, or experience symptoms that may be caused by any number of heart-related problems. These machines perform electrocardiograms, also called ECGs or EKGs, which measure the electrical activity of a patient's heart through harmless electrodes that are connected to the patient's chest, arms and legs