ELECTRONICS AND INSTRUMENTATION ENGINEERS ASSOCIATION
MUTHAYAMMAL ENGINEERING COLLEGE,
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INSTRONICS

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Role of Bio-medical Instrumentation

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Apts & Techs

SONY VAIO PC/TV

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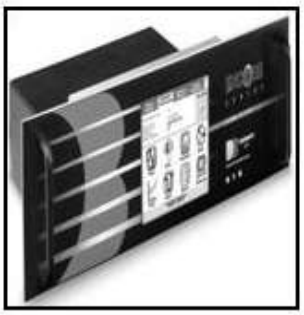
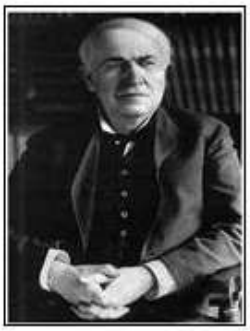




INSTRUMENTATION

Instrumentation is the branch of engineering that deals with measurement and control.

According to ISA or known as Instrumentation and Systems Automation Society formerly known as Instrument Society of America, the official definition of Instrumentation - is a collection of Instruments and their application for the purpose of Observation, Measurement and Control

Instrumentation engineering is the engineering specialization focused on the principle and operation of measuring instruments which are used in design and configuration of automated systems in electrical, pneumatic domains etc. They typically work for industries with automated processes, such as chemical or manufacturing plants, with the goal of improving system productivity, reliability, safety, optimization and stability. To control the parameters in a process or in a particular system Microprocessors, Micro controllers, PLCs etc are used, but their ultimate aim is to control the parameters of a system.

Instrumentation technologists, technicians and mechanics specialize in troubleshooting and repairing and maintenance of instruments and instrumentation systems. This trade is so intertwined with electricians, pipe fitters, power engineers, and engineering companies, that one can find him/herself in extremely diverse working situations. An over-arching term, "Instrument Fitter" is often used to describe people in this field, regardless of any specialization.

Instrument:

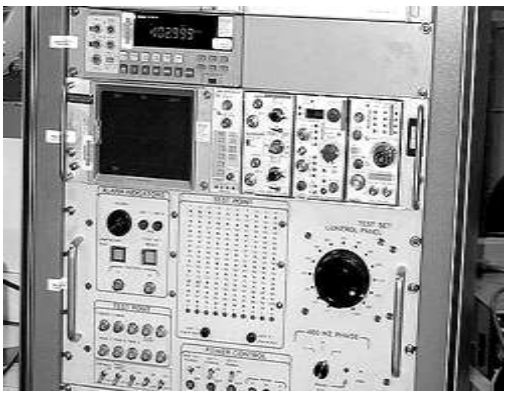
An instrument is a device that measures or manipulates variables such as flow, temperature, level, or pressure. Instruments include many varied contrivances which can be as simple as valves and transmitters, and as complex as analyzers. Instruments often comprise control systems of varied processes.. Instrumentation plays a significant role in both gathering information from the field and changing the field parameters, and as such are a key part of control loops.

Measurement:

Instrumentation can be used to measure certain field parameters (physical values). These measured values include pressure, either differential or static flow temperature - Temperature measurement level - Level Measurement , density viscosity, radiation, current , voltage inductance, capacitance, frequency resistivity ,conductivity ,chemical composition, chemical properties various physical properties .

Calibration:

Calibration is the set of operations that establish, under specified conditions, the relationship between the

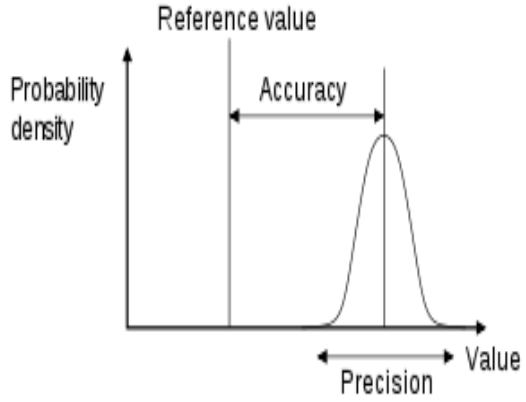


values of quantities indicated by a measuring instrument and the corresponding values realized by standards. International Vocabulary of Metrology (VIM). The result of a calibration may be recorded in a document, sometimes called a calibration certificate or a calibration report.

Accuracy and precision:

In the fields of engineering, industry and statistics, the accuracy of a measurement system is the degree of closeness of measurements of a quantity to its actual (true) value.

The precision of a measurement system, also called reproducibility or repeatability, is the degree to which repeated measurements under unchanged conditions show the same results. Although the two words can be synonymous in colloquial use, they are deliberately contrasted in the context of scientific method.



Accuracy indicates proximity of measurement results to the true value, precision to the repeatability or reproducibility of the measurement

Resolution:

Resolution Resolution (MSA) is the ability of the measurement system to detect and faithfully indicate small changes in the characteristic of the measurement result. Definition from (MSA) manual The resolution of the instrument is δ if there is an equal probability that the indicated value of any artifact, which differs from a reference standard by less than δ, will be the same as the indicated value of the reference.

Good versus poor a small implies good resolution the measurement system can discriminate between artifacts that are close together in value.

A large implies poor resolution - the measurement system can only discriminate between artifacts that are far apart in value.

Warning the number of digits displayed does not indicate the resolution of the instrument.

Manufacturer's statement of resolution as stated in the manufacturer's specifications is usually a function of the least - significant digit (LSD) of the instrument and other factors such as timing mechanisms. This value should be checked in the laboratory under actual conditions of measurement.

Experimental determination of resolution to make a determination in the laboratory, select several artifacts with known values over a range from close in value to far apart.

Start with the two artifacts that are farthest apart and make measurements on each artifact. Then, measure the two artifacts with the second largest difference, and so forth, until two artifacts are found which repeatedly give the same result.

The difference between the values of these two artifacts estimates the resolution. Consequence of poor resolution No useful information can be gained from a study on a gauge with poor resolution relative to measurement needs.

By
K.S.Ravivarma
Pre-final year (EIEA)

ROLE OF INSTRUMENTATION IN BIOMEDICAL

The 21st century has been labeled as the "Biological Century" with the expectation of profound implications to future technological breakthroughs both in the medical and other industrial sectors. In particular, we are on the threshold of a revolution in biology and medicine with the completion of the sequencing of the human genome, research to relate sequence to expression and eventually to cell and organ function.

These enormous changes signify critical transformation for many segments of industry and for the profession of biomedical engineering. While some of the traditional areas of biomedical engineering and its technology innovations will continue to flourish, we will face new challenges and greatly enhanced opportunities. Meeting these challenges and capitalizing on the new opportunities will make biomedical engineering the cornerstone for future technological advances with applications to research in biology and medicine, to health and to the delivery of health care.

Biomedical Engineering plays a vital role in hospitals because as we use Biomedical equipments on patients. Eg: There is a new ECG machine in a hospital but no one how to operate it, so we need a Biomedical Engineer to give a demo of the ECG machine i.e., how to operate/ how to connect the ECG cable to the patient. If there is a breakdown (not working) of the same machine no one knows about its function & repairs then again comes a Biomedical Engineer for servicing it i.e., he troubleshoots the problem, repairs the internal components or parts of the machine if needed or else rectifies the problem if its simple there itself.

So, it is mandatory to have a Biomedical Engineering in every hospital to overcome such problems of all the biomedical equipments. (Related to patients)

The biomedical engineer is becoming essential to understanding the enormous amount of information that is being generated by basic research, to using quantitative approaches, to integrating disparate components in order to understand complex living systems, to providing truly innovative solutions and to translating these to commercial products. The biomedical engineer is playing a critical role in research and in its applications to improving quality of life, and in implementing cost-effective solutions for delivery of health care.

New technologies that are likely to reach commercial stage in the next decade will be based on research in a variety of new areas such as functional genomics, imaging at the molecular and cellular levels, new imaging at the organ level, computational applications in bioinformatics and medical informatics, functional biomaterials, bio nanotech,
new instruments and devices for clinical medicine, and rehabilitation and assistive technologies.

Employment in the medical technology sector has increased steadily and projections by the U.S. department of Labor suggest that it will continue to increase significantly in the next decade.

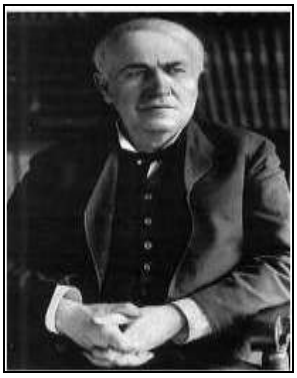
More importantly, while employment of engineers in general is projected to increase by fewer than 20%, the demand for biomedical engineers will grow by more than 30% in the next 10 years, demonstrating the importance of the biomedical engineering profession to future technological innovations and advances.

In summary, medical technology companies must be aware that new medical technologies are going to evolve in this century and that these technologies will be based on fundamental biological discoveries. It is clear that there exists a tremendous potential in the health care sector for both established and for new companies. Biomedical engineering is increasingly critical for the future of basic research and for the translation of research results to the commercial health care sector.

Finally, because of the projected increase in the health care sector there is a pressing requirement for accelerated development of human resources to meet the demands of new industries. This calls for an increase in the number of educational programs world-wide. In addition, since biomedical engineering is a truly interdisciplinary field, there is a need for a new approach to the educational process of the young generation of biomedical engineers that will fully integrate engineering, biology and medicine.

By
Prof. M.Suganthi
H.O.D (EIEA)

Thomas Alva Edison
A Life, an Inspiration!



"**Genius is one percent inspiration,**
Ninety- nine percent perspiration."
Thomas Alva Edison, Harper's Monthly
(September 1932)

Born	February 11, 1847(1847-02-11) Milan, Ohio
Died	October 18, 1931 (aged 84) West Orange, New Jersey
Occupation	inventor, scientist, businessman
Religious beliefs	Deist
Spouse(s)	Mary Stilwell (m. 1871–1884)) Mina Edison (m. 1886–1931))
Children	Marion Estelle Edison (1873–1965) Thomas Alva Edison Jr. (1876–1935) William Leslie Edison (1878–1937) Madeleine Edison (1888–1979) Charles Edison (1890–1969) Theodore Miller Edison (1898–1992)
Parents	Samuel Ogden Edison, Jr. (1804–1896) Nancy Matthews Elliott (1810–1871)
Relatives	Lewis Miller (father-in-law)

Thomas Alva Edison shook the world with his inventions, which changed the face of the world that was hundred years before to the world we are living in. Here are facts and information on the life of Thomas Alva Edison. There are many stories about Thomas Edison, which make different statements each about Thomas and his childhood.

According to some stories, Thomas was a very dumb boy. But the one that is believed to be true by historians and people is that Thomas had hearing problems, he was not attentive in his class and always faced problems because of the same reason. His teacher couldn't bare the situation anymore and considered him a dumb boy. His teacher started opposing the very idea of sending Thomas to a school of normal children with his ongoing hearing problems. (According to one story, his teacher one day gave Thomas a letter to give it to his mother and had sent him back home.

The letter said, "Your child is too dumb to attend the school!" This letter was further answered with a statement from Thomas's mother with another letter stating that her child was not a dumb boy, and she will teach him at home instead of sending him back to the school! And she started teaching Thomas at home. Even after facing such situations in his school, Thomas had developed immense interest in reading; he started reading almost anything that he found.

His hunger for reading helped him in developing interest in science, at the very young age of about 10, Thomas had set up a small laboratory in his room.

Thomas Edison began his career as an inventor in Newark, New Jersey, with the automatic repeater and his other improved telegraphic devices, but the invention which first gained him fame was the phonograph in 1877. This accomplishment was so unexpected by the public at large as to appear almost magical. Edison became known as "The Wizard of Menlo Park," New Jersey, where he lived. His first phonograph recorded on tinfoil around a grooved cylinder and had poor sound quality. The tinfoil recordings could only be replayed a few times. In the 1880s, a redesigned model using wax-coated cardboard cylinders was produced by Alexander Graham Bell, Chichester Bell, and Charles Tainter. This was one reason that Thomas Edison continued work on his own "Perfected Phonograph."

In 1870, Thomas established his company 'Edison Electronic Light Company' with the help from some people who provided him with finance. Thomas continued his quest for new inventions and never stopped in his life.

He next invented and publicly demonstrated his new invention: an incandescent electric light bulb and helped in installation of first ever Commercial Central Power System at Manhattan. Near 1887, Thomas moved to West Orange, New Jersey to develop and establish his new laboratory and research facility. Thomas further spent rest of his life inventing at his new research lab at West Orange.

The list of Thomas Edison's inventions and his research work is so long that it is almost impossible to jolt-down everything in one single article. Thomas Edison was probably the first person to register more than 1000-patented inventions on his name. In his entire life, Thomas never tried to slow down on his invention work and never had a break, even when he married first to Mary Stillwell in 1870, and after death of his first wife when he second time married to Mina Miller in 1886, he always kept thinking and working hard to invent something new.

By
P.Ezhlilarasu
II year (EIEA)

Intelligent Instrumentation Deploying effective motor management

Instrumentation and control (I&C) systems not only play important roles in plant operation, but also in reducing the cost of power generation while maintaining and/or enhancing safety. Instrumentation is a broad area in the sense that it has an interdisciplinary character. There is a proliferation of various instrumentation systems for a variety of purposes. Motors are one of the most widely used equipment and forms an integral part of instrumentation and this is where intelligent motor management matters.

Most manufacturing process relies on instrumentation for monitoring chemical physical and environmental properties as well as the performance of production lines. There is hardly any area of engineering, science and technology where instrumentation in one form or the other is not needed as a certain process is becoming more and more automated, the need for a closer monitoring of inputs ans responses become more obligatory and the instruments the component and subsystem levels tend to become more integrated. Instrumentation being a broad area, here we describe motor control centers (MCCs), which is an important component of instrumentation.

Industrial applications using motors are increasingly getting more complex and closely connected with each other. Each individual motor can play critical part in the production chain any motor tripping, failure or downtime can lead to a huge monetary loss. In order to prevent this, we need to have more sophisticated ways to protect a motor.

At the same time, transparency and providing information to the operator from the individual motor control centers are essential. The uptime of a plant can be increased tremendously by delivering early warnings of any kind toa supervisory level, before some motor is actually shut down. This requirement is nowadays often reffered to as intelligent controls systems (DCS), to collect and process the different data acquired and control the plant accordingly.

Intelligent Motor Control:

In today's motor management systems there are numerous built-in functions. A few of them are discussed here. The most important control functions like the direct starter, reversing starter, star-delta starter, two speed motors and so on should be predefined so that even an inexperienced user can start the system without having to consult the operating manual.

The user should be required to enter only the basic motor data for the system to be running. Any add-on functionality can then be defined based on these starting parameters. Beside the motor control functions, there should also be plenty of logic functions available.

These are essential to replace the conventional function relays and to flexibly process the signals directly at the MCC level. Now a flawless wiring of even complex control circuits can be made with the click of a mouse in the parameterization software. With this functionality, the amount of process data to be evaluated-and such to be programmed –in the PLC or DCS can be reduced tremendously. The built-in logic functions in an intelligent motor management system can differ between manufacturers. A few of such functionalities include:

- Timers
- Counters
- Limit monitors
- Truth tables
- Calculation modules and so on.

In order to make the best use of these built-in logic functions, it is essential that the intelligent motor management system has sufficient input and output capacity.

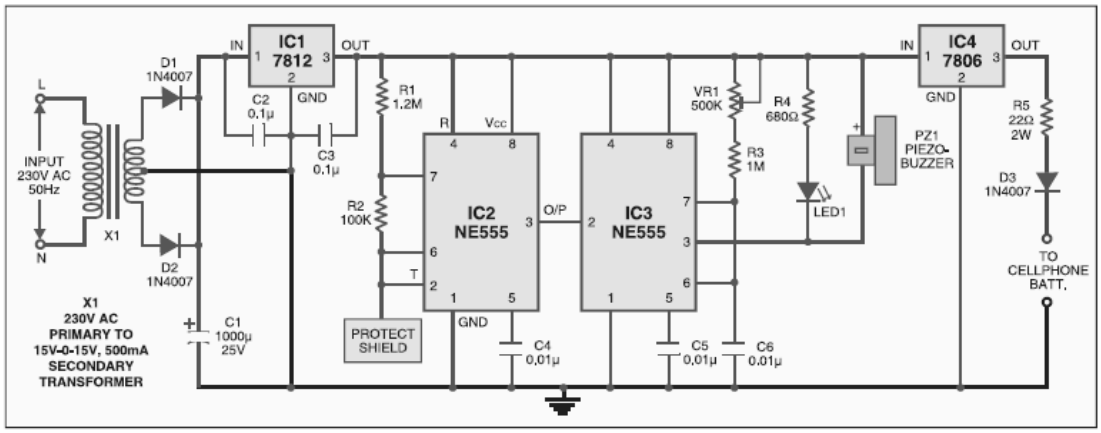
Data measurement and storage:

A state-of-the-art motor management system has to support numerous measurements. Most important is the measurement of currents and voltages in the main circuit. These data are essential for the motor protection. Based on these, other essential values can be calculated, for instance power energy. Besides different operating data, intelligent motor management system also provides diagnosis and statistical data. Diagnosis data will help the operator to understand the nature of a fault and quickly put the system back in operation. These can be informed like tripping time, reason of tripping and multiple data logging at that moment. The statistical data supply information would support a maintenance team. Such information includes operahours, overload trips, start-stop-cycles and so on.

By
M.Sakthivel
Pre-final year (EIEA)

MOBILE SHIELD

Protect your mobile phone from unauthorized use or theft using this simple circuit. It can generate a loud chirping sound when somebody attempts to take away the mobile handset. The circuit is also works as a mobile charger. Regulator *IC 7812* (IC1) along with noise filter capacitors C2 and C3 provides regulated power supply. The circuit utilizes two *NE555* timer ICs One as a simple astable multivibrator (IC2) and the second as a monostable (IC3). The astable multivibrator has timing resistors R1 and R2 but no timing capacitor as it works with stray capacitance. Its pins 6 and 2 are directly connected to a protecting shield made up of 10cm×10cm copper-clad board. The inherent stray capacitance of the circuit is sufficient to given an output frequency of about 25 kHz with R1 and R2. This arrangement provides greater sensitivity and enables the circuit with hand capacitance effect. Output pulses from the oscillator are



Directly given to trigger pin 2 of the monostable. The monostable uses a low-value capacitor C6, resistors R3 and reset VR1 for timing. The output frequency of the monostable is adjusted using preset VR1 such that it is slightly less than that of the astable. This makes the circuit standby, when there is no hand capacitance present. So in the standby mode, the astable's output will be low. The warning LED1 and buzzer are connected such that they become active only when the output of the monostable sinks current. In the standby state, the LED1 remains 'off' and the buzzer is silent. ***As somebody tries to take the mobile phone from the protecting shield, his hand comes near the shield or makes contact with the shield, which introduces hand capacitance in the circuit.*** As a result, the astable's frequency changes, which makes the trigger pin of the monostable low and its output oscillates.Leads of all capacitors should be short. Adjust VR1 slowly using a plastic screwdriver until the buzzer stops sounding. Bring the and close to the shield and adjust VR1 until the buzzer sounds. With trial-and-error procedure, set it for the maximum sensitivity such that as soon the hand comes near the shield, the buzzer starts chirping and the LED blinks.

By
N.Balasubramaniam
Pre-final year (EIEA)

Technical Questions

1. Justify – "Precised" Meters are Accurate ?
2. Why the scales of the MI instruments are not - Uniform?
3. How the Galvanometer can be converted in to voltmeter?
4. Which is the best and widely used "Biasing Scheme"?
5. What types of LED's are used for Remote Applications?
6. What's the role of the "Commutator" in DC-motors?
7. How many transistors are present in the substrate of the op-amp IC 741?
8. What type of sensor used for temperature measurement in industries?
9. Why Damping is Necessary in Analog instruments?
10. Meggers are used for?

Aptitude Questions

1. A is twice as good as B and together they finish a piece of work in 18 days in how many days will A alone finish the work?
   a) 27
   b) 24
   c) 26
   d) 24
2. A person travels equal distances with speeds of 3km/hr, 4km/hr, and 5km/hr and takes a total time of 47 minutes. the total distance in km is
   a) 2
   b) 3
   c) 4
   d) 5
3. On 8th Feb. 2005 it was Tuesday. What was the day of the week on 8th Feb.2004?
   a) Tuesday
   b) Monday
   c) Sunday
   d) Wednesday
4. The sum of the numerator and denominator of a fraction is 11 if 1 is added to the numerator and 2 is subtracted from the denominator it becomes 2/3 the fraction is
   a) 5/6
   b) 6/5
   c) 3/8
   d) 8/3

- ❖ The Answers will be published in the next issue.
- ❖ The winners name will also be published.

You can send your Answers TO:
The Chief Editor,Electronics and Instrumentation Dept,
Muthayammal Engineering College,
Rasipuram-637408.

LATEST PRODUCTS

CS3 Speakers – Affordable but Elegant

Emerald Physics have launched the cool and awesome CS3 loudspeakers. Though these speakers are not exactly expensive, they are seriously mind blowing and you can get to hear your music in the best form until now. They were launched at the AK fest on May 2nd and I am sure music buffs would be elated at the prospects of listening to music on such cool speakers.

It comes with a 2 way point source design and 12″ point source driver. The controlled directive technology helps the sound to emanate from the speakers in a unique way, so as to allow the listener experience amazing quality. You can choose among mahogany, cherry and maple finishes and they cost between $2,995 and $3,295.

SONY Out With New Touch-screen PC and TV

Sony has just launched its new VAIO all-in-one PC/TV. Yes, PC or TV because it can function as both. The new VAIO L looks as good as its own earlier versions. It is unique for its features and its price tag. The 24-inch, 1920 x 1080 (1080p) touch-screen television and personal computer has an HDMI in-port which you can plug in to your PS3. It has high picture resolution and can be connected to the internet with ease!

VPC-L114 model also has a Blu-ray Disc™ optical drive for users to play movies. It comes with a rewrite able BD drive to record, store and play back personal content. You can connect a compatible HD cable box, satellite receiver or PLAYSTATION-3 (all sold separately) via a single cable and enjoy HD entertainment without powering on the PC.

By
Vel Murugan
II year (EIEA)

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