

**ELECTRONICS AND INSTRUMENTATION ENGINEERS ASSOCIATION
MUTHAYAMMAL ENGINEERING COLLEGE,
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INSTRONICS

The Best INSTRUMENTATION Magazine, 19th January 2011, Vol.7



SENSORS



PRODUCTS

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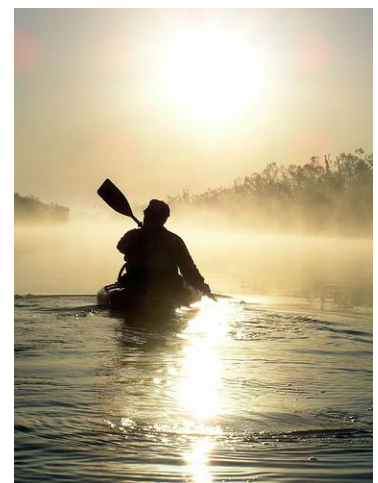
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***“Our life is what our thought makes of it
Great thought comes from the heart”***

*We thank Our Esteemed Management and Our Beloved
Principal **Dr.M.Madheswaran** for their valuable guidance and
encouragement in bringing up this magazine “**INSTRONICS**”
successfully.*

- EIE ASSOCIATION

LIFE IS INTERESTING....WHEN...!!...?

Life is interesting when it is filled with uncertainties every moment, when you are tasting success only some times and experiencing failures many times, not knowing what will happen in the next moment, when money comes from an unexpected source, when your girl friend all of a sudden calls you and shares with you her likes and dislikes, or when she avoids you on so many occasions even if you persistently make all effort to please her, your friend gives you a surprise phone call or email after so many years, when your bed ridden grand father recovers to full health or when your healthy uncle passes away suddenly.



Life is interesting when you are promoted suddenly to take up higher challenges or when you are suspended suddenly for actions what you are not responsible, when your boss doesn't care about your presence in the organization or when your boss praises you a lot amidst a group of dignitaries and gives you an extraordinary hike in your salary , when the bike you liked

the most got stolen on one fine morning or when you got the first prize in a national contest you participated a year ago and forgotten totally for which you are rewarded with the latest car, when you missed the flight due to your late arrival in the airport and later you find that the flight had met with an unfortunate accident and all the passengers on board were dead and when you take the deep breadth that you are the lucky one to come late on that day and miss the flight or when you arrived on time to the airport and due to some technical snag, the flight got delayed for a day.

Life is interesting when you are able to sign an important agreement and that time your pen doesn't write or when you have prepared with all the tough questions on the earth to face the interview in your dream company and when the interviewer doesn't ask you any questions and gives you the job just by looking at your credentials, when you have spent countless sleepless nights to come out with a novel business proposal and when you find that the idea has been implemented already by somebody or when you have copied somebody's idea for which you are rewarded handsomely, when you were preserving something which will be a treasure ("Pokisham") one day and when you find that the treasure has become a thing of past and lost its value or when you find a piece of post card has become a worldly treasure to possess, when you were expecting the particular thing not to happen has happened or when you find the particular thing to happen has not happened, when you have planned certain thing to accomplish after five years and fortunately you are able to achieve within five months or when you have planned something to get it

within five days, you are not able to get it even after so many years and so on and so forth and the list is endless....

Everyone should realize that the life could be made ever interesting if you are living in the present, not worrying or thinking about what has happened in the past and not thinking about the future and the most important not expecting for what you have done and as well as for what you have not done. Even the best of the best fortune tellers in the world can not predict the happenings of the next moment very accurately. There should be and will be always a sense of uncertainty in all our actions and in everything happening around us to make the life interesting.

Even the greatest prediction of Nostradamus that the earth will become extinct one day was also disapproved. Even the greatest anxiety of the 21st century viz., Y2K problem came out to become a matter of child's game. It is that the anxiety, suspense, thrill and uncertainty keep everyone moving and enjoying what they do.

The secret of humanity lies in digging out knowns and unknowns of life. The scientists are trying to find out the origin of human species on earth. They are trying to decode the secret of human life existence scientifically. The moment they have found the exact year of origin of life on Earth, and then they too can find out correct date for extinction of life on the earth planet. Anything which has beginning has to have formidable end on someday. This is the universal law of Certainties.

If everyone knows the results of their venture in advance, then no one will venture in to the unknowns. The whole world has developed to this

stage because of one simple phenomenon, "greater uncertainties in life, better and faster developments in the world in the fields of science, technology and management and in all spheres of life leading to bring comfort living for the humanity".

To have an interesting life, one should always take the path filled with uncertainties. Greater uncertainties mean more unknowns, more risks and more things to explore and decode and extended life period. In life one can not say which one is right or wrong. What is right in India is left in US, what is east in India is west in US, dawn in US is dusk in India and so on.

What is sacred for Hindus is not so for Muslims and what is considered holiness for Christians is not so for Hindus, what is true today may not be the same tomorrow and what was considered sacred yesterday may not be same today, what was considered the precious one day may become thing of common man's possession, what was thought impossible yesterday, now it is everyone's ordinary game, what was thought to be unreachable one day, today it has become easily accessible by everyone, what it was taking decades to accomplish, being achieved in matter of few days, the life is becoming interesting day by day and one has to understand the secrets of it and enjoy it to the maximum

By:

**Prof.K.Elamvazhuthi,
Professor of Management.**

TERMS & DEFINITIONS:

ABSOLUTE PRESSURE: Gauge pressure plus atmospheric pressure.

ABSOLUTE ZERO: Temperature at which thermal energy is at a minimum. Defined as 0 Kelvin, calculated to be -273.15°C or -459.67°F.

ACOUSTICS: The degree of sound, the nature, cause, and phenomena of the vibrations of elastic bodies; which vibrations create compressional waves or wave fronts which are transmitted through various media, such as air, water, wood, steel, etc.

ADAPTER: A mechanism or device for attaching non-mating parts.

ALLOY 11: A compensating alloy used in conjunction with pure copper as the negative leg to form extension wire for platinum-platinum rhodium thermocouples Types R and S.

ALLOY 200/226: The combination of compensating alloys used with tungsten Vs tungsten 26% rhenium thermocouples as extension cable for applications under 200°C.

ALLOY 203/225: The combination of compensating alloys used with tungsten 3% rhenium Vs tungsten 150%rhenium thermocouples as extension cable for applications under 200°C.

ALLOY 405/426: The combination of compensating alloys used with tungsten 5% rhenium Vs tungsten 26% rhenium thermocouples as extension cable for applications under 870°C.

ALOMEGA : An aluminum nickel alloy used in the negative leg of a type K thermocouple (registered trademarks of OMEGA ENGINEERING, INC.).

ALUMEL: An aluminum nickel alloy used in the negative leg of a Type K thermocouple (Trade name of Hoskins Manufacturing Company)

AMBIENT COMPENSATION: The design of an instrument such that changes in ambient temperature do not affect the readings of the instrument.

AMBIENT CONDITIONS: The conditions around the transducer.

AMBIENT PRESSURE: Pressure of the air surrounding the transducer.

AMBIENT TEMPERATURE: The average or mean temperature of the surrounding air which comes in contact with the equipment and instruments under test.

AMPLITUDE SPAN: The Y-axis range of a graphic display of data in either the time or frequency domain. Usually a log display (dB) but can also be linear.

ANTI-RESET WINDUP: This is a feature in a three-mode PID controller which prevents the integral (auto reset) circuit from functioning when the temperature is outside the proportional band.

ASYMMETRY POTENTIAL: The potential developed across the glass membrane with identical solutions on both sides. Also a term used when comparing glass electrode potential in pH 7 buffer.

By:

**Mr.R.ArunVikkaram,
Final year(MEIEA).**

CHARLES **WHEATSTONE :**



Born : 6 February 1802
Gloucester, England
Died : 19 October 1875
Fields : Physics
Residence : United Kingdom

Sir Charles Wheatstone, was an English scientist and inventor of many scientific breakthroughs of the Victorian era, including the English concertina, the stereoscope (a device for displaying three-dimensional images), and the playfair cipher (an encryption technique). However, Wheatstone is best known for his contributions in the development of the Wheatstone bridge which is used to measure an unknown electrical resistance.

Cryptography:

Wheatstone's remarkable ingenuity was also displayed in the invention of cyphers. He was responsible for the then unusual playfair cipher, named after his friend Lord playfair. It was used by the militaries of several nations through at least world war I, and is known to have been used during world war II by

British intelligence services. It was initially resistant to cryptanalysis, but methods were eventually developed to break it. He also became involved in the interpretation of cypher manuscripts in the British Museum. He devised a cryptograph or machine for turning a message into cypher which could only be interpreted by putting the cypher into a corresponding machine adjusted to decrypt it.

Wheatstone's bridge:

In 1843 Wheatstone communicated an important paper to the Royal Society, entitled 'An Account of Several New Processes for Determining the Constants of a Voltaic Circuit.' It contained an exposition of the well known balance for measuring the electrical resistance of a conductor, which still goes by the name of Whetstone's Bridge or balance. His paper abounds with simple and practical formula: for the calculation of currents and resistances by the law of Ohm. He introduced a unit of resistance, namely, a foot of copper wire weighing one hundred grains and showed how it might be applied to measure the length of wire by its resistance. He was awarded a medal for his paper by the Society. The same year he invented an apparatus which enabled the reading of a thermometer or a barometer to be registered at a distance by means of an electric contact made by the mercury. A sound telegraph, in which the signals were given by the strokes of a bell, was also patented by Cooke and Wheatstone in May of that year.

By:

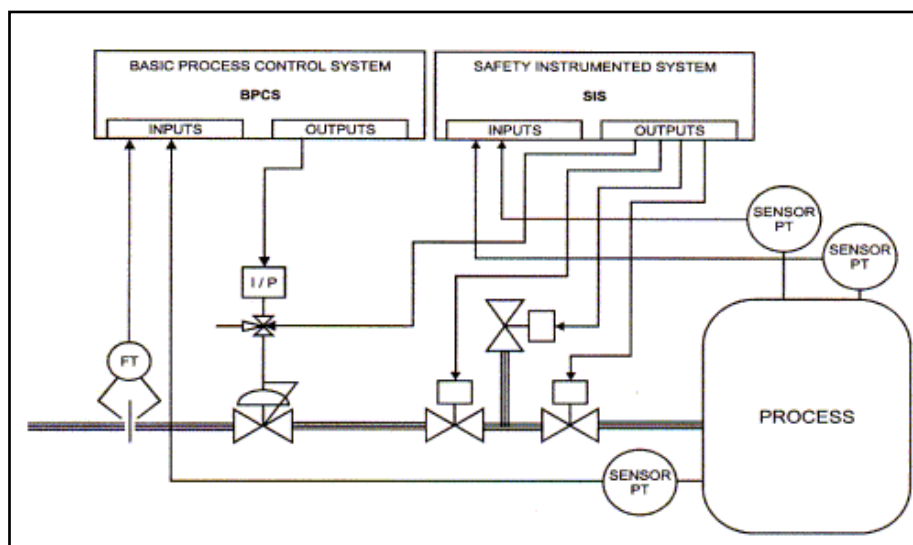
Ms.S.A.Tasneem Nasreen,
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SAFETY INSTRUMENTED SYSTEM (SIS):

A Safety Instrumented System (SIS) is a new term used in standards like IEC 61511 or IEC 61508 for what used to be called Emergency Shutdown System ESD, Safety Shutdown System, Interlock System, Permissive Systems, etc.

Instrumented Systems to provide safe isolation of flammable or potentially toxic material in the event of a fire or accidental release of fluids.

This online training tutorial will explain the basic concepts, definitions and commonly used terms in Safety Instrumented Systems and provide a basic understanding of related concepts.



A Safety Instrumented System consists of one or more Safety Instrumented Functions (SIF).

The operation of many industrial processes involves inherent risks due to the presence of dangerous material like gases and chemicals.

Safety Instrumented Systems are specifically designed to protect personnel, equipment and the environment by reducing the likelihood (frequency) or the impact severity of an identified emergency event.

Explosions and fires account for millions of dollars of losses in the chemical or oil and gas industries each year. Since a great potential for loss exists, it is common to employ Safety

Safety and layers of Protection:

Safety is provided by layers of protection. These layers start with safe and effective process control, extend to manual and automatic prevention layers, and continue with layers to mitigate the consequences of an event.

The first layer is the Basic Process Control System (BPCS). The control system itself provides significant safety through proper design of process control.

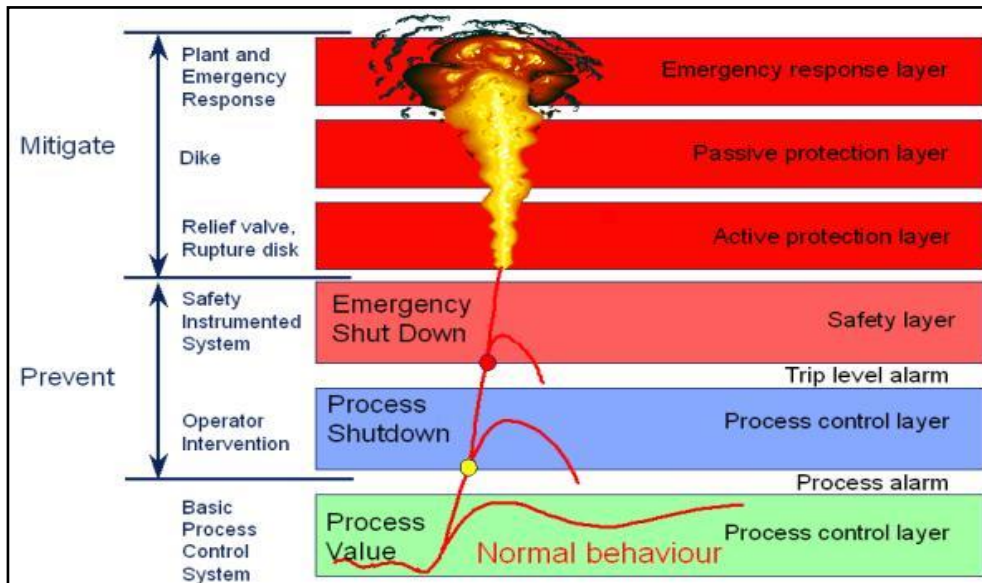
The next layer of protection is also provided by the control system and the system operators. Automated shutdown sequences in the process control system combined with operator

intervention to shut down the process are the next layer of safety.

The third layer is the Safety Instrumented System . It is a safety system independent of the process control system. It has separate sensors, valves and logic system. No process control is performed in this system, its only role is safety.

The final layer is plant and emergency response. If a large safety event occurs this layer responds in a way that minimizes ongoing damage, injury or loss of life. It may include evacuation plans, fire fighting, etc.

Overall safety is determined by how these layers work together.



These layers are designed to prevent a safety related event. If a safety related event occurs there are additional layers designed to mitigate the impact of the event.

The fourth layer is an active protection layer. This layer may have valves or rupture disks designed to provide a relief point that prevents a rupture, large spill or other uncontrolled release that can cause an explosion or fire.

The fifth layer is a passive protection layer. It may consist of a dike or other passive barrier that serves to contain a fire or channel the energy of an explosion in a direction that minimizes the spread of damage.

Elements Of Safety Instrumented Systems:

Sensors:

Field sensors are used to collect information necessary to determine if an emergency situation exists. The purpose of these sensors is to measure process parameters used to determine if the equipment or process is in a safe state.. These sensors are dedicated to the Safety Instrumented System .

Logic Solver:

The purpose of this component of Safety Instrumented Systems is to determine what action is to be taken based on the information gathered. It is typically a controller that reads signals from the sensors and executes

pre-programmed actions to prevent a hazard by providing output to final control elements.

Final Control Element:

It implements the action determined by the logic system. This final control element is typically a pneumatically actuated On-Off valve operated by solenoid valves. It is imperative that all three elements of the SIS system function as designed in order to safely isolate the process plant in the event of an emergency.

Probability of Failure upon Demand (PFD):

By understanding how components of a Safety Instrumented System SIS can fail, it is possible to calculate a Probability of Failure upon Demand (PFD). There are two basic ways for SIS to fail.

The *first way* is commonly called a spurious trip which usually results in an unplanned but safe process shutdown. While there is no danger associated with this type of SIS failure, the operational costs can be very high.

The *second type* of failure does not cause a process shutdown or nuisance trip. Instead, the failure remains undetected, permitting continued process operation in an unsafe or dangerous manner. If an emergency demand occurred, the SIS would be unable to respond properly.

These failures are known as covert or hidden failures and contribute to the probability PFD of the system failing in a dangerous manner on demand. The PFD for the Safety Instrumented System is the sum of PFDs for each element of the system. In order to determine the PFD of each

element, the analyst needs documented, historic failure rate data for each element. This failure rate (dangerous) is used in conjunction with the Test Interval TI term to calculate the PFD. It is the test interval TI that accounts for the length of time before a covert fault is discovered through testing.

Increases in the test interval directly impact the PFD value in a linear manner; **E.g.** if you double the interval between tests, you will double the Probability of Failure on Demand, and make it twice as difficult to meet the target Safety Integrity Level (SIL).

The governing standards for Safety Instrumented Systems state that plant operators must determine and document that equipment is designed, maintained, inspected, tested and operated in a safe manner. Thus, it is imperative that these components of Safety Instrumented Systems be tested frequently enough to reduce the PFD and meet the target SIL.

Depending on application use, other names used for SIS Safety Instrumented Systems are:

- Emergency Shutdown Systems.
- Burner Management Systems.
- Fire and Gas Systems.
- Critical Turbomachinery Control.
- Semiconductor Life Safety Systems.
- Nuclear 1E Safety Systems.

By:

**Mrs.K.Radhika,
Lecturer / EIE.**

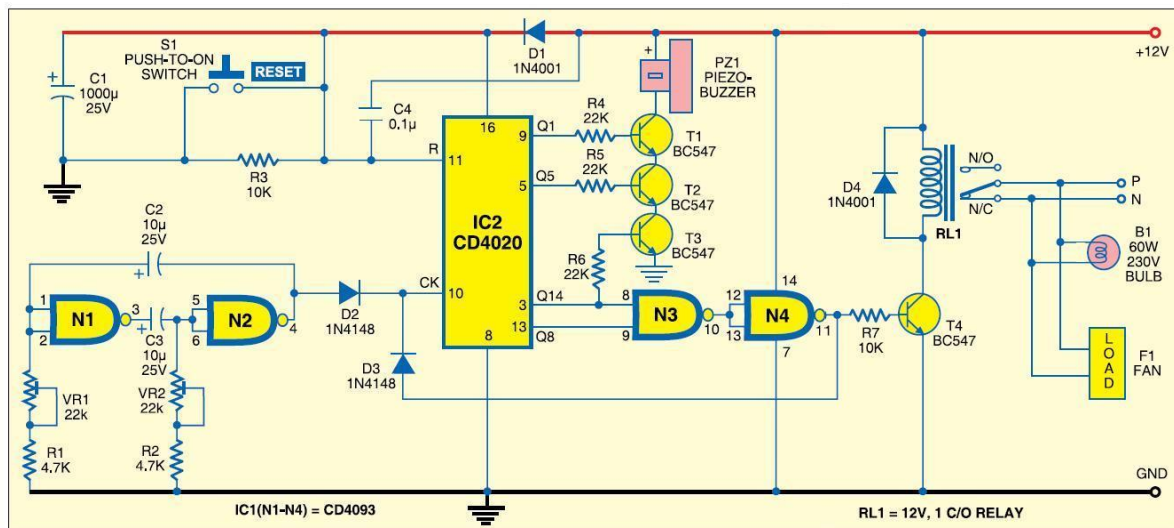
ANTISLEEP ALARM FOR STUDENTS :

This circuit saves both time and electricity for students. It helps to prevent them from dozing off while studying, by sounding a beep at a fixed time interval, say, 30 minutes.

If the student is awake during the beep, he can reset the circuit to beep in the next 30 minutes. If the timer is not reset during this time, it means the student is in deep sleep or not in the room, and the circuit switches off the light and fan in the room, thus preventing the wastage of electricity.

half an hour after the reset of IC1, transistors T1, T2 and T3 drive the buzzer to sound an intermediate beep.

If IC2 is not reset through S1 at that time, around one minute later the output of gate N4 goes high and transistor T4 conducts. As the output of gate N4 is connected to the clock input (pin 10) of IC2 through diode D3, further counting stops and relay RL1 energises to deactivate all the appliances. This state changes only when IC1 is reset by pressing switch S1. Assemble the circuit on a general purpose PCB and enclose it in a suitable cabinet.



The circuit is built around Schmitt-trigger NAND gate IC CD4093 (IC1), timer IC CD4020 (IC2), transistors BC547, relay RL1 and buzzer.

The Schmitt-trigger NAND gate (IC1) is configured as an astable multivibrator to generate clock for the timer (IC2). The time period can be calculated as $T=1.38 \times R \times C$.

If $R=R1+VR1=15$ kilo-ohms and $C=C2=10 \mu F$, you'll get 'T' as 0.21 second. Timer IC CD4020 (IC2) is a 14-stage ripple counter. Around

Mount switch S1 and the buzzer on the front panel and the relay at the back side of the box. Place the 12V battery in the cabinet for powering the circuit. In place of the battery, you can also use a 12V DC adaptor.

By:

**Mr.J.Arun Pandiyan,
Second Year(MEIEA).**

Reference: EFY Magazine.

VIRUSES BUILT BETTER BATTERIES:

A genetically modified virus can be used to construct both the cathode and anode of a lithium-ion battery. Virus-built rechargeable batteries would have the same power capacity as the batteries used to power hybrid cars.



Two genes of the **M13** virus to equip the bacteriophage with peptide groups that attract single-walled carbon nanotubes at one end, while the other end of the virus was equipped with peptides that nucleate amorphous iron phosphate.

Combining the nanotubes with the iron phosphate created a highly conductive material that was used in a cathode.

Virus-built battery could be recharged 100 times without losing capacitance. The incorporation of carbon nanotubes increased battery conductivity without adding too much weight.

These advances feed into wider cross-disciplinary investigations into energy harvesting the technique of extracting power from the environment.

ANTI - GRAVITY PLATFORM:

The whole world (floating) can be in your hands the Antigravity Platform is basically a big electromagnet that levitates and illuminates the goodies via an included magnetic stand.

Several powerful magnet (mains-powered device) is capable of mimicking the effect of anti-gravity, levitating and slowly rotating a globe above its mirrored, LED-laden base.



We can use the Anti-Gravity Platform to showcase your nick nacks (no sniggering). Simply flip open the globe, remove the magnetic platform within and gasp in amazement as whatever item you fancy (up to 85g) floats and rotates in mid-air

The point is the Anti-Gravity Platform is the ideal way to show off our favourite bits and bobs whilst marveling at the wonders of modern science. **Float on!**

By:

**Mr.M.Dinesh Kumar,
Pre-Final year(MEIEA).**

BEGINNERS' GUIDE TO ADOBE PHOTOSHOP

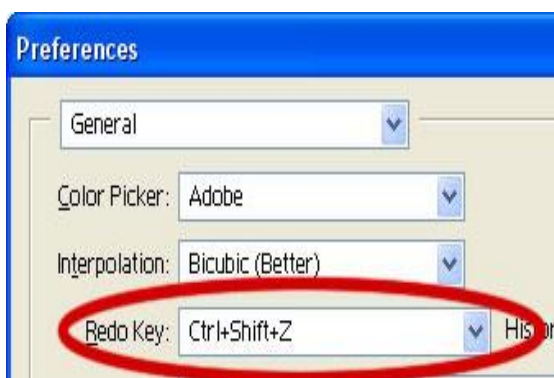
PAGE 1 OF 4:

Ever wanted to learn how to use Adobe Photoshop, but had no idea where to start? The wall of icons and menus can be intimidating.

Most Photoshop tutorials for beginners are really for people who are already familiar with the program. This tutorial goes right back to the DAWN OF TIME! and is designed to help people who are absolute Photoshop beginners.

This basic, tutorial is not a comprehensive instruction manual. It only teaches you the few simple features you need to know, to start using Adobe Photoshop. From there, you'll quickly discover most of the other features of the program yourself.

The images in this tutorial are from Adobe Photoshop 7.0, but they're very similar to those from newer versions, like Photoshop CS4.

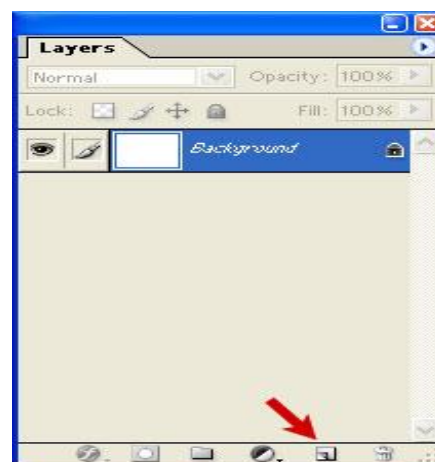


1) Creating A New Image, And Setting Adobe Photoshop's Undo Option:

Click **File > New**, and create a new image of any size you desire.

Press **Ctrl+K** to bring up the Preferences window.

Change your **"Redo Key"** to **Ctrl+Shift+Z**. This enables you to press **Ctrl+Z** at any time, to undo the last thing(s) you did.



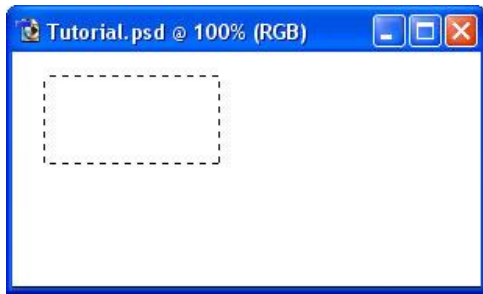
2) Using Adobe Photoshop's Layers window:

The Layers window shows the various layers that your image is made up of. To make a new layer, click the New Layer button, as shown by the red arrow.

To work on a different layer, click on that layer. The eyeball will appear next to that layer. You can drag layers up and down the list.


Remember ! create a new layer for each part of your image. This allows you to go back and edit the layers individually. Every Adobe Photoshop beginner at some time makes a masterpiece, only to find out that they did it all on one layer, and now they

can't remove those pink clouds they put on it.

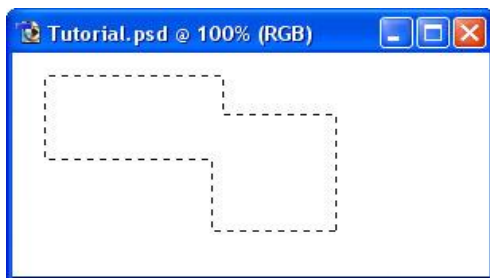


3) Learning about Selection:

One of the most important concepts in Adobe Photoshop is Selection.

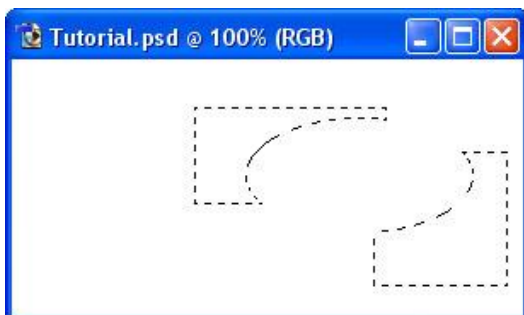
 This is the Rectangular Selection Tool.

Use this tool on your image to select an area of the image. This lets Photoshop know that that's the area you want to work on.




4) Adding to a Selection and making a square:

To add to a selection, hold Shift before dragging. To make the selection exactly square, start dragging, then hold **Shift**.

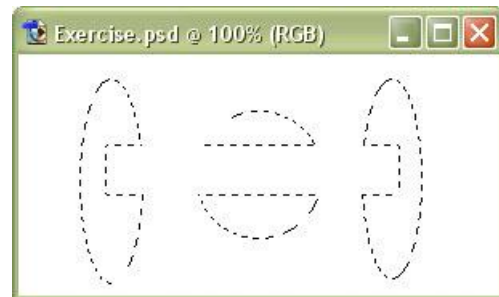


You can press **Ctrl+D** to "*deselect*" and remove the selection at any time.

5) Elliptical Selections and subtracting Selections:

 Hold down on the Selection Tool on the Toolbar, and choose the Ellipse. To move the selection, just click inside it and drag.



Holding Alt while selecting subtracts that area from the selection. I've done that with the Ellipse Selection Tool.



6) A Selection exercise:

If you're following this tutorial in Adobe Photoshop, see if you can make these shapes.

Other Relevant Adobe Photoshop tools:

-  **Lasso Tool** – Allows you to draw a selection area with the cursor.
-  **Magic Wand** – Summons elves. (Also believed to select an area of one colour.)

To be contd...

By:

**Mr.C.Vijay,
Pre-Final year(MEIEA).**

LEVEL MEASUREMENT SENSOR:

An electronic device that measures the height of material—typically liquid—inside a tank or other vessel. Point level measurement sensors are used to mark a single discrete liquid height—a preset level condition. Continuous level sensors are more sophisticated and can provide level monitoring of an entire system. They measure fluid level within a range, rather than at a one point, producing an analog output that directly correlates to the level in the vessel. To create a level management system, the output signal is linked to a process control loop and to a visual indicator.

1)Non-Contact Ultrasonic Level Sensor:

With power and programming options, RS-232 or RS-485 communications capability, pushbutton calibration, and temperature-compensated signaling, LVU40 Series sensors bring another dimension of flexibility to continuous non-contact liquid level measurement.



Highly accurate over their entire range of 0.3 to 18.3 m (1 to 60'), they incorporate filtering that virtually eliminates false echoes from peripheral obstructions. In conjunction with a PLC or an OMEGA CNi Series controller, they can be used for point level measurement.

2)Radar Level Sensor:

In applications requiring non-contact measurement of liquid levels, affordable LVRD500 radar transmitters is the logical extension of ultrasonic sensors.



They are ideal where vapor, dust, or a foaming surface prevents ultrasonic measurement. Their radar sensor uses microwave pulse technology to track target liquids from the antenna tip to the bottom of a tank.

This advanced "*echo marker*" signal processing provides a reliable continuous pulse shape unaffected by environmental conditions. RS-232 and RS-485 models are available.

3)Dry Material Rotary Paddle Level Switch:

Compatible with many granular, pelletized, and powdered substances, LVD-800 Series rotary paddle switches use patented magnetic technology that makes fail-safe bin, hopper, silo, and tank monitoring a reality.



A self-diagnosing microcontroller constantly monitors rotation of the shaft and motor mounting plate, reacting immediately to material presence and to mechanical or electrical failure. Magnetic sensing avoids the fouling problem inherent to optical systems. High-temperature models are rated to 399°C (750°F).

4)Capacitance Measurement Probe:

It can able to withstand high temperatures and pressures, and impervious to many corrosives, LV3000/4000 Series probes give reliable continuous level measurements in difficult applications. Appropriate for liquids, pastes, and some solids—whether conductive or non-conductive—they have no moving parts and are easy to install.



After rectifying and filtering incoming power, generating a radio frequency signal, and calculating changes in current, the electronic circuitry produces a 4 to 20 mA 2-wire output signal proportional to the process level. Convenient zero and span adjustments let the user factor in variables such as media type, vessel dimensions, rod length, and installation position.

By:

**Ms.M.Kanimozhi,
Final year(MEIEA).**

ANSWERS:

Mind Twister:

Q.no.	Answer
1	b) 3
2	b) Atlas: Maps
3	a) Ashok Chavan
4	a) S.M.Krishna
5	b) Suresh Kalmadi
6	b)2
7	d) Prakash Raj
8	b) Mexico
9	a) Kiran Mazmumdar
10	a) Sunil Mittal
11	d) Optocoupler
12	b) TRIAC
13	d) Pyrometer
14	d) intel 8086
15	d) PID

Cross Word:

R	E	L	P	P	O	D		
	K							
	5	C	A	I	R	T	7	
	E	L	E	C	T	R	2	N
	L		M					O
			9					
	V		H					T
K	I	L	O					O
	4							
	N	E	W	T	O	N		N
				O	Z	E	I	P
								8
								3

TECHS & APPS:

1) $u(t)$ represents the unit step function. The Laplace transform of $u(t-\tau)$ is

- (A) $1/s\tau$ (B) $1/s - \tau$
(C) $e^{-s\tau} / s$ (D) $e^{-s\tau}$

2) A measurement system with input $x(t)$ and output $y(t)$ is described by the differential equation $3(dy/dt)+5y=8x$. The static sensitivity of the system is

- (A) 0.60 (B) 1.60 (C) 1.67 (D) 2.67

3) Poisson's ratio for a metal is 0.35. Neglecting piezo-resistance effect, the gauge factor of a strain gage made of this metal is

- (A) 0.65 (B) 1 (C) 1.35 (D) 1.70

4) Match the Following:

P. Radiation Pyrometer	W. Angular velocity
Q. Dall tube	X. Vacuum pressure
R. Pirani gauge	Y. Flow
S. Gyroscope	Z. Temperature

- (A) P-Z, Q-W, R-X, S-Y
(B) P-Z, Q-Y, R-X, S-W
(C) P-W, Q-X, R-Y, S-Z
(D) P-Z, Q-X, R-W, S-Y

5) In a pulse code modulated (PCM) signal sampled at f_s and encoded into an n -bit code, the minimum bandwidth required for faithful reconstruction is

- (A) $2nf_s$ (B) $nf_s/2$ (C) nf_s (D) f_s

6) 25 persons are in a room. 15 of them play hockey, 17 of them play football and 10 of them play both hockey and football. Then the number of persons playing neither hockey nor football is

- (A) 2 (B) 17 (C) 13 (D) 3

7) Choose the most appropriate word from the options given below to complete the following sentence:

If we manage to _____ our natural resources, we would leave a better planet for our children.

- (A) Uphold (B) Restrain
(C) Cherish (D) Conserve

8) The question below consists of a pair of related words followed by four pairs of words. Select the pair that best expresses the relation in the original pair. *Unemployed: Worker*

- (A) Fallow : Land
(B) Unaware : Sleeper
(C) Wit : Jester
(D) Renovated : House

9) Which of the following options is the closest in meaning to the word below?

Circuitous

- (A) Cyclic (B) Indirect
(C) Confusing (D) Crooked

10) Choose the most appropriate word from the options given below to complete the following sentence:

His rather casual remarks on politics _____ his lack of seriousness about the subject.

- (A) Masked (B) Belied
(C) Betrayed (D) Suppressed

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**WHAT IS THE
MEANING OF
LIFE ?**

**WHATEVER YOU
WANT IT TO BE**

