NATIONAL ENGINEERING COLLEGE

(AN AUTONOMOUS INSTITUTION)

K,R,NAGAR,KOVILPATTI-628503.

EEE NEWSLETTER

July 2014

Volume 2 Issue 2

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

VISION & MISSION OF THE COLLEGE

VISION:

Transforming lives through quality Education and research with human values

MISSION:

1. To maintain excellent infrastructure and highly qualified and dedicated faculty.
2. To provide a conducive learning environment with an ambience of humanity, wisdom, creativity and team spirit.
3. To promote the values of ethical behaviour and commitment to the society.
4. To partner with academic, industrial and government entities to attain collaborative research.

VISION & MISSION OF THE DEPARTMENT

VISION:

Promoting active learning, critical thinking coupled with ethical values to meet the global challenges.

MISSION:

1. To instill state-of-the-art technical knowledge and research capability that will prepare our graduates for professionalism and life-long learning.
2. To update knowledge to meet industrial and real world challenges.
3. To inculcate social and ethical values.

PROGRAMME EDUCATIONAL OBJECTIVES (PEO):

The main objective of the B.E., Programme in Electrical and Electronics Engineering is to prepare students for either one or more of the following:

1. Excel in industrial or graduate work in Electrical Engineering and allied fields.
2. Practice their profession conforming to ethical values and active participation in the affairs of the profession.
3. Adapt to evolving technologies and stay current with their profession.

CONTENTS

STAFF ACHIEVEMENTS/ACTIVITIES

Staff Achievements

1. Dr. M. Willjuice Iruthayarajan, Professor and Head of our department has been selected as a secretary for IEEE Computational Intelligence Society (CIS), Madras Chapter.
2. Anna University, Chennai has approved Dr. L. Kalaivani as supervisor for Research under the faculty of Information & Communication Engineering. Her areas of specialization are Switched Reluctance Motor, Control of Drives and Soft Computing Techniques.
3. Dr. L. Kalaivani has taken incharge as IEEE Student Branch counselor of our college. IEEE Student Branch organizes Inter college project exhibition, symposiums, Workshops, Guest Lectures and various technical activities for the benefits of the students every year.

Staff Activities

S.No.	Name of the Staff	Events	Topic	Date	College
1	Mr.N.B.Prakash, Associate Professor	7 Days STTP	Soft Computing Techniques in Clinical Decision Making	7^{th} – 15^{th} July 2014	PSNA College of Engineering and Technology, Dindugul

DEPARTMENT ACTIVITIES

EEE ASSOCIATION INAUGURAL

"The roots of education are bitter, but the fruit is sweet" told the great philosopher Aristotle. And with this task of giving the sweet fruit to students, through some extra technical classes and coaching, which the students feel bitter but to enhance their skills and knowledge in engineering and society, EEE Association of Department of Electrical and Electronics Engineering was started in the past. In the words of great men "Well begun is half done" the Inaugural function of EEE Association for the academic year 2014-2015 was held in college auditorium on 4.7.2014, Friday at 10.00 AM.

The Inaugural function, started with praise to mother tongue, was presided over by Chief guest Mr.R. Murali Ganesan , Director of Venus Electronics and the gracious presence of college Principal Dr.P.Subburaj, our Head of the department Dr.M.Willjuice Iruthayarajan and Mrs.R.V.Maheswari, Asso.Prof/ EEE. Our student secretary Mr.A.Venkat Subramanian (Final year EEE) welcomed the gathering. Followed that year plan for the academic year 2014-2015 was put forward by Ms.M.Manogari (Pre final Year EEE). Next to that introduction about the chief guest was delivered by Ms.A.Muthu Meena Sundari (Final Year EEE).The inaugural address was presented by Mrs.R.V.Maheswari, Asso Prof/ EEE. Video launch was launched by our chief guest. The chief guest suggested the students to gain knowledge about basics in EEE and Latest Technology to enhance their career. He pointed about the competitions of India with

China. He also stressed that, even though there is a misconception, that Chinese products are always not good in quality, he told that the quality of Chinese products were good, except some discrepancies. The notable point that he made during his speech was, that he encouraged the students to analyze the design and the innovations in Chinese products, which also have the additional feature of low cost. Finally the vote of thanks was delivered by Mr.N.Arun Kumar (Final Year EEE). The inaugural function came to an end with National Anthem.

Then next, after the inaugural function, the chief guest had interaction with the students of Final Year EEE. The function presided well and we present our kind and sincere thanks to Management Committee, Director, Principal, Head of Department, staff members and students for their works and patient presence for the inaugural function of EEE Association.

EEE OFFICE BEARERS LIST

Secretary	: A.Venkat Subramanian-Final EEE
Joint-Secretary	: M.S.Pranav Karthikeyan-Third EEE
Student Co-ordinator	: N.Arunkumar-Final EEE
Treasurer	: A.Muthmeena Sundari-Final EEE
Co-Treasurer	: M.Manogari-Third EEE
Program Co-ordinator	:S.Ahamed Ibrahim-Final B.Saratha Devi-Final EEE S.Mohamed Suhail-Third EEE R.Uma Maheshwaran-Third EEE
Event Co-Ordinator:	:K.S.Vignesh-Final EEE M.S.Archana-Final EEE N.Sheik Moideen-Third EEE M.Gurusamy-Third EEE
Executive Member	:R.Muthu Karthic-Third EEE S.Natarajan-Third EEE B.VijayaSankarVignesh-Second EEE N.Selva Karthika- Second EEE K.Madasamy- Second EEE E.Abirami Devi Bala-Second EEE

EEE ASSOCIATION ACTIVITIES

TRAINING ON COMSOL

As a part of various activities conducted by EEE Association, a workshop was organized on the 'COMSOL' software package related to the designing the electrical equipments. The workshop was conducted for II year and III year students. The session was handled by Ms.R.V.Maheswari.M.E., Associate Professor, convener of the EEE Association and Mr.B.Vigneshwaran, M.E, Assistant Professor, of Electricals and Electronics Engineering Department. The first session was took part in 30.07.2014 (Wednesday) as an afternoon session for 22 students of pre-final year 'A' Section . The second session and third session were conducted on 02.08.2014 (Saturday) forenoon and afternoon for II year and III year students. The session includes how to design an capacitor with single and multi dielectrics, analyzing the field and potential distribution of various electrode configuration. Apart from that for third year students designing of insulator under normal and pollution condition were trained.

The feedback provided by the three batches concluded that these classes were very helpful and would help in their projects and placements. It was planned to extend the classes for the remaining students too.

HOME BASED APPLIANCES INSTALLATION SERVICING

The EEE Association organized a workshop of II year EEE students on "HOME BASED APPLIANCES INSTALLATION SERVICING" on 19.07.2014 (Saturday) from 10:00am to 1:00pm. The session was handled by our lab technician Mr.K.Subburaj and Mr. Chelladurai of EEE Department. The basics of house wiring and basement wiring etc., were taught. The concepts of working of household electrical appliances like mixers etc., were explained in-depth. Fuse wiring systems were described. Also the repairing methodologies of electrical appliances were taught briefly. After a brief introduction to these concepts students were asked to practically carry out the repairs and wiring.

The feedback provided by students stated that the workshop was very useful and interesting and are willing to participate in similar workshops.

SPECIAL INTEREST GROUP

EMBEDDED SYSTEM

The Special Interest Group on Signal Processing and Embedded System was conducted on 05.07.2014. Mr.N.B.Prakash (Asso.Prof/EEE) delivered the technical talk about the Introduction of Harmonics. He encouraged as searching harmonics about in MATLAB and to do some project based on embedded system. He shown various Power Point Presentation and videos related to harmonics. The session was interesting according to our knowledge. At end of the session, students said feedback that we have gained some information about in the field of harmonics.

SOFT COMPUTING TECHNIQUES

The Special Interest Group on Intelligent Controller and Soft Computing was conducted on 05.07.2014 by Mr.J.Sivadasan (AP-Sr.G/EEE). The Project model TRMS (Twin Rotor MIMO System) has been demonstrated and possible way of controlling the TRMS model have been taught to the students. The usage of MATLAB for controlling the TRMS has been briefed. The feedback software has been explained. The doubts raised by the students regarding the TRMS model have been explained.

ENERGY ENGINEERING

The class of Special Interest Group on Energy Engineering was conducted on 05.07.2014. It was carried on by Mr.S.Thirumalai Kumar (AP/EEE). He taught the students about renewable and non-renewable sources of energy with special emphasis on solar and wind energy. The working principle of photovoltaic cell and the wind turbine was explained by him. Then a project report on solar energy which was done by him during his tenure of studies was presented. Finally, the class came to an end with some assignments given to students on conventional and non-conventional energy sources.

POWER ELECTRONICS

A seminar on "Overview of Recent trends in Power Electronics" was conducted on 19.07.2014 by Mr.M.Genga Raj, Assistant Professor /EEE at Class Room H2 for Special Interest Group (SIG) members. The objectives of today's session are:

- Recent ongoing research on power electronics field
- Effect of Power electronics in Renewable energy resources
- Basic MATLAB modeling of power electronic devices

Initially he started with the properties of semiconductors devices and he gave a brief history about the power electronic converters. Then he discussed about the recent trends & ongoing research in power electronics field. He suggested some of the area in power electronics field for IV year project. The final year students got clarified the ideas relevant to the project. He asked the final year students to refer recent IEEE power electronics journal papers for their project.

Then he demonstrated how to design the basic power electronic circuits in MATLAB software. The third year students got the idea about the design of power electronic devices using MATLAB.

The session was started by 10.00 AM and completed by 12.30PM. Totally 31 students from final & third year were participated and got the relevant information about the recent trends in power electronics.

HIGH VOLTAGE ENGINEERING

A seminar on "Modeling of FEM Analysis and Recent issues in High Voltage Engineering" was conducted on 19.07.2014 by Mr.B.Vigneshwaran, Assistant Professor /EEE at Class Room H6 for Special Interest Group (SIG) members. The objectives of today's session are:

- Recent ongoing research on High Voltage Engineering
- Effect of Electric field and potential distribution in electrical power apparatus
- Basic modeling of insulators in COMSOL Software

Initially he started with the definition of partial discharge and their important role in the prediction of life data analysis of electrical power apparatus which is operated in high stress. Then he gave a brief history about the necessity and role of modeling an electrical apparatus in FEM analysis. After that he discussed about the recent trends & ongoing research in high voltage engineering field. He suggested some of the area in high voltage field for IV year project. The final year students got clarified the ideas relevant to the project. He asked the final year students to refer recent IEEE dielectrics and electrical insulation, Electric power system research (Elsevier) journal papers for their project.

Then he demonstrated how to generate and measure the HVAC, HVDC and impulse in high voltage. After that he show that how the PD readings are measured in laboratory. At last he explained the pollution performance of HV insulators.

The session was started by 10.00 AM and completed by 12.45PM. Totally 20 students from final & third year were participated and got the relevant information about the recent trends in high voltage engineering.

LIQUID DIELECTRICS

A seminar on "Introduction to anti oxidants and Blending in transformer oil" was conducted on 19.07.2014 by Mr.P.Samuel Pakianathan, Assistant Professor /EEE at Elective Hall No. 1 for Special Interest Group (SIG) members. The objectives of today's session are:

- Purification of oil
- Alternative material
- Eco-friendly

He gave a brief history on transformer oil and its nature. He discussed about the properties of transformer oil such as

1. Colour and appearance
2. density-used for type identification.
3. Viscosity-important parameter for the heat dissipiation
4. Flash point, fire point-indication of flammability of oil.
5. Aniline point-related to impulse strength and gaseous characteristics.
6. Acidity-measure of a trace of acidic or alkaline contaminants in the oil

Then he also demonstrated about the methods of improving the transformer oil performance by adding anti oxidants to it and also explained about the types of anti oxidants. They are

1. natural anti oxidants
2. artificial anti oxidants.

The popular anti oxidants are alpha lipoic acid,coenzyme ,kinetin,vitamin c(asc orbic acid),vitamin E (tocopherol),BHA,BHT,alpha –T,citric acid,and then limiting factors of natural anti oxidants.Finally he discussed about the breathing process of transformer.

A number of nineteen students from Third year and final year attended the session and knows more information related to transformer oil.

POWER SYSTEM

The first class of the 'Power System' of Special Interest Group was held on 19.7.2014. It was handled by Mr.G.Kannayeram Asst. Prof (Sr. grade)/EEE. The class started by about 10.30A.M. About 38 students from final year and pre final year got benefitted from this class. During his lecture, he conveyed about role of Smart Grid in power sectors. He explained about the benefits of smart grid compared to normal grid and smart meters. He then made the students to get a clear idea about the Pondicherry Smart Grid Project. To make the students get a crystal clear understanding of the concepts, He presented videos and some power point slides. Let us see, some of the notable points in power point presentations and videos.

Currently India leads the world third in generation transmission and distribution of electric power. Therefore a strong and efficient means of transportation of electrical power is needed to fulfil our future requirements. This need is met by using smart grids. Smart grids deliver electrical power using digital technology. They also monitor the supply to the consumers. In the existing grid, there is limited delivery system. The cost is also high and is also frequent power quality interruption. The communications are also too slow.

In the new proposed smart grid system, the energy efficiency is high. It also has direct load control. It has distributed generation and co generation. They also have the additional advantage of automated demand response.

This smart grid class is more informative for the students. Some of the final year students are also interested to do the project in smart grid area. The class is finally ended around 1.00 P.M.

UNIVERSITY RANK HOLDERS

The following students got their top three ranks in the End semester university examination (May 2014)

SECOND YEAR

S.No	SECTION 'A'		SECTION 'B'	
	NAME	GPA	NAME	GPA
1.	Maheswari.K	9.51	UmaDevi.S	9.17
2.	AcsalPremiSubha.A	9.44	Sathya.S	9.10
3.	Madsamy @ Yuvaraja.K	9.3	Soundarya.K	9.10
4.	Kirthika.S	9.3	Poolammal.M	9.10

PRE FINAL YEAR YEAR

S.No	SECTION 'A'		SECTION 'B'	
	NAME	GPA	NAME	GPA
1.	Anto Sharon Prakash.A	9.12	Pradeepa.C	9.4
2.	Divyalakshmi.S	9.06	VisnuVidya.R	9.08
3.	AngalaParameshwari.S.T	9.0	Usharani.R	9.06

FINAL YEAR

S.No	SECTION 'A'		SECTION 'B'	
	NAME	GPA	NAME	GPA
1.	Mari Selvi @ Abitha.G	9.48	NanthiniDevi.P	9.73
2.	Krishnaveni.S	9.34	JeyaRani.C	9.26
3.	MahibaCathline.B	9.30	Saravanan.S.R	9.08

Technical Articles by Staff Member

ELECTRICAL INSULATION – OVERVIEW

M.BAKRUTHEEN,
Assistant Professor/EEE
National Engineering College

INTRODUCTION:

An electrical insulation is a material whose internal electric charges do not flow freely, and therefore make it very hard to conduct an electric current under the influence of an electric field. A perfect insulation does not exist, but some materials such as glass, paper and Teflon, which have high resistivity, are very good electrical insulating materials.

The reason for using insulating materials is to separate electrically the conducting parts of equipment from each other and from earthed components. Earthed components may include the mechanical casing or structure that is necessary to enable the equipment to be handled and to operate. Whereas the 'active' parts of the equipment play a useful role in its operation, the insulation is in many ways a necessary evil.

Electrical insulation is the physical basis of high voltage engineering. Reliable insulation is related to application of high voltage systems. The materials which have very high resistivity i.e. offers a very high resistance to the flow of electric current. Insulating materials plays an important part in various electrical and electronic circuits. In domestic wiring insulating material protect us from shock and also prevent leakage current.So the insulating material offers a wide range of uses in engineering applications.

REQUIREMENT OF GOOD INSULATING MATERIAL:

There is thousands of insulating material available but a good insulating material should have following properties:

- **Resistance**: A good insulation material must have high resistance so that leakage current through the material should be low. This reduces the chances of electrical shock.

- **Break over/Breakdown Voltage**: A good insulating material should have high breakdown voltage so that it may not get broken or destroyed during high voltage pulse across it.
- **Heat Dissipation:** The insulation of an insulator decreases with the increase in temperature so if the temperature of an insulator increases due to excessive heat produced, its resistance will be decreased and it will not serve its purpose.
- **Small effect of Environment**: A good insulator must have as minimum effect of external environment factors as possible. It should not lose its resistance due to water drops or other environmental factors.
- **Relative permittivity (or dielectric constant):**A good insulator must have as minimumpermittivity. Permittivity is defined as the ratio of the electric flux density produced in the material to that produced in vacuum by the same electric field strength. Relative permittivity can be expressed as the ratio of the capacitance of a capacitor made of that material to that of the same capacitor using vacuum as its dielectric.
- **Dielectric loss (or electrical dissipation factor):**A good insulator must have as low dielectric loss factor. Dielectric loss factor is defined as the ratio of the power loss in a dielectric material to the total power transmitted through it. It is given by the tangent of the loss angle and is commonly known as tan delta.

TYPES OF INSULATING MATERIAL:

Insulating materials can be classified in two ways.

1. Based on their material
2. Based on their temperature withstand capacity

Based on the material:

Insulating materials can be classified further based on materials as,

1. Solid Insulation
2. Liquid Insulation
3. Gaseous Insulation

Solid Insulation:

A vast number of solid insulating materials are used in electrical power engineering. With the invention of modem insulating materials, many earlier conventional materials have been discarded, especially in case of electrical machines, capacitors and power cables. From the usage

point of view, the solid insulating materials can be divided into the following three broad categories:

Moulding materials: These are used for providing mechanically rigid forms of insulation, for example, insulators and bushings etc. Such materials are required to have good electrical insulating properties besides having high mechanical strength. These are usually made out of ceramics, glass (toughened glass), fibre glass reinforced plastics and epoxyresins.

Jacketing materials: Polymers have been found suitable for providing insulating jackets to the conductors. For example, polyethylene (PE), polyvinylchloride (PVC), natural and synthetic rubber and paper are used in power cables, capacitors and transformers. Mica and fibre glass based plastic tapes are used in electrical machines.

Filling materials: Beside oils, wax based draining land non draining impregnating compounds of different types are used to impregnate paper in power cables, transformers, capacitors, and instrument transformers.

Insulating mechanical support: In the form of plates, pipes and ledges insulating supports are required in transformers, GIS, circuit breakers and isolators. The products, such as press boards, hard paper (thin paper laminates), wood (yellow teak) are used in transformers. Ebonite, also known as vulcanite, is a form of cross linked rubber containing large proportion of sulphur, bakelite, a hard synthetic material, and acrylic resin plates are used for insulating supports in other equipment.

However, the most common method of classifying the solid insulating materials is based upon their chemical compositions, distinguished mainly between **inorganic and organic materials**.

Among the inorganic materials; ceramics, glass, fibre glass, enamel, mica and asbestos are important and have found their wide application as dielectrics in the order of the mentioned sequence. They distinguish themselves in their unique ability to withstand high temperatures in addition to their being highly chemical resistant. There is practically negligible sign of ageing in these materials. However, it is difficult to machine or process them. These materials are basically inhomogeneous both microscopically as well as macroscopically.

Solid organic materials used in electrical engineering are: paper, wood, wax, leather, cotton besides a number of natural and synthetic resins, rubbers and plastics, also known as polymers. Wood being so hygroscopic is rarely used as such, but wooden poles supporting overhead cables and distribution lines are being widely used in North America.

The polymeric organic insulating materials used in electrical engineering have a very high molecular weight and consist of two or more polymeric compounds of several structural units normally bound together by covalent bonds. The individual structural units may consist of single atoms or may be molecular in nature, which repeat in a regular order.

A polymer can be obtained by the reaction of compounds having at least two reactive functional groups which can react under suitable conditions. These chemical compounds are known as 'monomers'. There can be one or a mixture of reacting monomers and in the latter case, the resulting material is called 'copolymer'.There are several ways of classifying polymers and one of them is by their response to heat. Accordingly, the polymers are divided into two groups of materials as follows.

Thermoplastic Polymers: Thermoplastic polymers soften and supple on heating and 'solidify' on cooling. The heating and cooling cycle within a certain temperature limit can be applied to these materials several times without affecting their properties. Polymers which generally have a linear structure fall in this category. The synthetic thermoplastic materials used in electrical engineering for insulation purposes are; polyethylene (PE), polyvinylchloride (PVC), polypropylene (PP) and polyamide (PA). The extent of their application in the industry is in the order of their above mentioned sequences. Such materials have relatively poor thermal resistance and their properties deteriorate rapidly at higher temperature.

Thermoset Polymers: The polymers which soften when heated for the first time resulting into cross-linking reaction (network formation), are known as thermoset polymers. This reaction, leading to the formation of network structure, is also known as curing or setting of the polymer. All monomers having functionality equal to two would give rise to linear polymers and, therefore, thermoplastic materials. However, when they have functionality more than two, the resulting polymer has a network structure. The polymers used for electrical insulation purpose are desired to retain their rubbery (flexible) properties. Hence, these are defined as 'lightly cross-linked polymers'.

Liquid Insulation:

From the point of view of molecular arrangements, liquids can be described as 'highly compressed gases ' in which the molecules are very closely arranged. This is known as kinetic model of the liquid structure. However, the movement of charged particles, their microscopic streams and interface conditions with other materials cause a distortion in the otherwise undisturbed molecular structure of the liquids. The well known terminology describing the breakdown mechanisms in gaseous dielectrics, such as, impact ionization, mean free path, electron drift etc. is, therefore, also applicable for liquid dielectrics.

Liquid dielectrics are accordingly classified in between the two states of matter that is gaseous and solid insulating materials. This intermediate position of liquid dielectrics is also characterized by its wide range of application in power apparatus. Insulating oils are used in power and instrument transformers, power cables, circuit breakers, power capacitors etc. Here they perform a number of functions simultaneously, namely:

- Insulation between the parts carrying voltage and the grounded container, as in transformers.
- Impregnation of insulation provided in thin layers of paper or other materials, as in Transformers, cables and capacitors, where oils or impregnating compounds are used.
- Cooling action by convection in transformers and oil filled cables through circulation.
- Filling up of the voids to form an electrically stronger integral part of a composite dielectric.
- Arc extinction in oil circuit breakers.
- High capacitance provided by liquid dielectrics with high permittivity to power capacitors.

A large number of natural and synthetic liquids are available which can be used as dielectrics. These possess a very high electric strength and their viscosity and permittivity vary in a wide range. The appropriate application of a liquid dielectric in an apparatus is determined by its physical, chemical and electrical properties on one hand, and on the other, it depends upon the requirements of the functions to be performed.

The insulating liquids, commonly applied in high voltage apparatus, are classified as illustrated in the following diagram (Fig. 1).

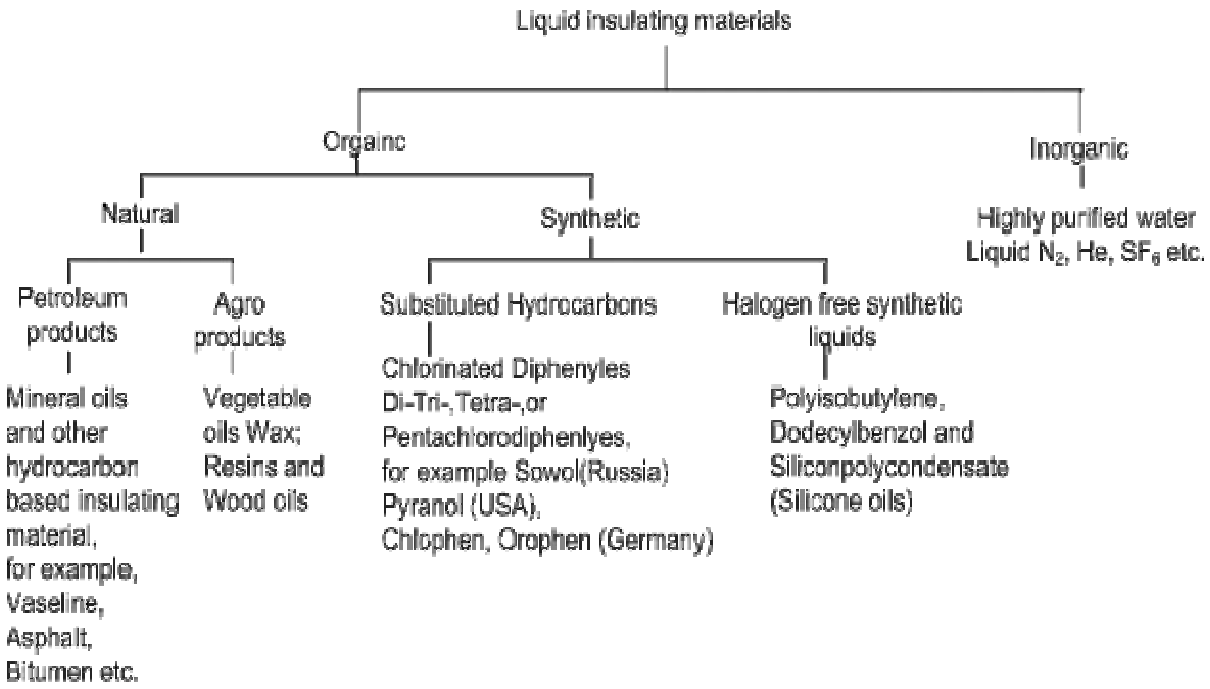


Fig. 1. Classification of Liquid Insulating material

Gaseous Insulation:

Gas insulated material with high electrical breakdown field strength intensity and departure, breakdown can be rapid recovery after the insulation, chemical stability, non-flammable, non-explosive, non-aging, non-corrosive and difficult for the discharge by the decomposition, and the large specific heat capacity , thermal conductivity, fluidity were good. Air is the most widely used gas-insulated material. For example, the AC and DC transmission lines overhead wires, the overhead wires on the ground by the air between the insulation. Standard capacitors are also used high-pressure gas-insulated medium, early adopters of high-pressure nitrogen or carbon dioxide, are multi-purpose sulfur hexafluoride (SF_6). SF_6 is also used to manufacture high voltage circuit breakers, metal enclosed switchgear, gas insulated transmission pipelines and gas-insulated transformer cables.

The summary of insulation based on material is given in the Table 1.

Table 1. Insulation based on material

State	Materials	Examples
Solid Insulating Materials	Fibrous materials	wood, paper and card board, insulating textiles
	Impregnated fibrous materials	impregnated paper, varnished or impregnated textiles
	Non resinous materials	asphalts and bitumens, waxes
	Ceramics	porcelain, steatite, alumina, titanate, etc.
	Glass	fused quartz or silica glass, Pyrex, fiber glass
	Natural and synthetic rubbers	natural rubber, hard rubber, butyl rubber, neoprene, hypalon, silicon rubber
Liquid Insulating Materials	Oils	Refined hydrocarbon minerals oils, Linseed oil, silicon liquids, vegetable oils etc.
	Varnishes	synthetic varnishes and spirit
Gaseous Insulating Materials		Carbon dioxide (CO_2), Dry air, argon, nitrogen, SF_6, etc.

Based on Temperature Class:

Another significant aspect of all insulating materials that dominates the way in which they are categorized is the maximum temperature at which they will perform satisfactorily. Generally speaking, insulating materials deteriorate over time more quickly at higher temperatures and the deterioration can reach a point at which the insulation ceases to perform its required function. This characteristic is known as ageing, and for each material it has been usual to assign a maximum temperature beyond which it is unwise to operate if a reasonable life is to be achieved. The main grading or classes of insulation as defined in IEC 60085:1984 and its UK equivalent BS 2757:1986(1994) are listed in Table 2.

Where a thermal class is used to describe an item of electrical equipment, it normally represents themaximum temperature found within that product under rated load and other conditions. However, not all the insulation is necessarily located at the point of maximum temperature, and insulation with a lowerthermal classification may be used in other parts of the equipment.

Table 2. Insulation materials based on the temperature Class

Class	Temperature (in degree celsius)	Materials
Y	90	Cotton, silk, paper, cellulose, wood etc.neither impregnated nor immersed in oil
A	105	Cotton, silk and paper suitablly impregnated with natural resins, cellulose ester or immersed in oil
E	120	Synthetic resin enamles, cotton and paper laminates with formalidehyde bonding etc
B	130	Mica, glass fibres, asbestos with suitable bonding substances built up Mica, glass fibres, asbestos laminates
F	155	Mica, glass fibres, asbestos Built up Mica, glass fibres, asbestos laminates etc.
H	180	Silicon elstomer and materials like Mica, glass fibres, asbestos with suitable bonding substances such as silicones
C	ABOVE 180	ceramics, glass, quartz without binders or with silicon biners of higher thermal stability

LIFE TIME ANALYSIS:

Life time of insulating material is analyzed with the ageing of insulation. The ageing of insulation depends not only on the physical and chemical properties of the material and thethermal stress to which it is exposed, but also on the presence and degree of influence of mechanical,electrical and environmental stresses. The processing of the material during manufacture and the way inwhich it is used in the complete equipment may also significantly affect the ageing process.The definition of a useful lifetime will also vary according to the type and usage of equipment; for instancethe running hours of a domestic appliance and a power station generator will be very different over a25-year period.

All of these factors should therefore influence the choice of insulating material for aparticular application. There is therefore a general movement in the development of standards and methodsof testing for insulating materials towards the consideration of combinations of materials or insulatingsystems, rather than focusing on individual materials.

CONCLUSION:

The electrical insulation plays a major role in determining the proper functioning of electrical apparatus. So the selection and maintenance of electrical insulation are made with considering long term application.

Technical Articles by Students

ROBOT DOCTOR

A pillar of health reform is improving access to the best health care for more people. Technology is a cost-effective and increasingly potent means to connect clinics in the vast and medically underserved rural regions of the United States with big city medical centers and their specialists. Telemedicine is well established as a tool for triage and assessment in emergencies, but new medical robots go one step further—they can now patrol hospital hallways on more routine rounds, checking on patients in different rooms and managing their individual charts and vital signs without direct human intervention.

The RP-VITA Remote Presence Robot produced jointly by iRobot Corp. and InTouch Health is the first such autonomous navigation remote-presence robot to receive FDA clearance for hospital use. The device is a mobile cart with a two-way video screen and medical monitoring equipment, programmed to maneuver through the busy halls of a hospital.

IndhuMathy.M
Prefinal year 'B'

DIGITAL PENS

This digital pen is a computer invention that transmits writing into digital media. Many professions hand-write their notes, tables, diagrams and drawings instead of using tablets or other devices.

A digital pen is an input device which captures the handwriting or brush strokes of a user, converts handwritten analog information created using "pen and paper" into digital data, enabling the data to be utilized in various applications Another useful feature of this computer invention is that hand-written digital files can be easily converted into text fonts for use in word documents or emails. Digital pen technology was first developed by the Swedish inventor and entrepreneur ChristerFåhraues. This computer invention has been licensed to companies around the world for various commercial products. Applications include data/signature capture, completing forms, mapping, surveying, document management, paper replay, whiteboards, toys and education.

Accelerometer : Accelerometer-based digital pens contain components that detect movement of the pen and contact with the writing surface.

Positional : Position-based digital pens use a facility to detect the location of the tip during writing. Some models can be found on graphics tablets made popular by Wacom.

Camera : Camera-based pens use special digital paper to detect where the stylus contacts the writing surface, such as those using Anoto technology.

By,
Uma Maheswaran.R,
Pre final EEE.

BATTERY-BACKED LED LAMP SOCKET FOR EMERGENCY LIGHTING

Emergency lighting is a complicated problem, especially in commercial buildings. For safety, such a building must have some type of lighting than can continue to operate in the case of power failure. Traditionally, buildings have installed dedicated emergency lighting, but increasingly low-power LED sources are enabling new approaches to the challenge.

In a public-venue applications, for instance, we covered how dimmable LEDs enable the requisite emergency lighting in London's Wembley Arena to also be a part of the house lighting system. For industrial applications, Dialight is able to power its Safe Site stainless-steel LED linear luminaire with an integrated 3.6V NiMH battery. It's the efficiency and dimmability of LED sources that have enabled such products and applications.Wireless Environment is taking a broader view of the problem and planning to use the ubiquitous A-lamp along with the Switch Sense socket to provide emergency lighting. Most every commercial, or residential, building has Edison-based sockets readily available. The sockets can be installed with a conventional lamp in many types of fixtures, including the downlight implementation pictured nearby. The Switch Sense Bulb Adaptor can detect the difference between a switch in the off state and a building power failure and deliver up to three hours of emergency lighting

The main advantages of Switch Sense are that no new wiring is required to implement the emergency function and that the socket can be readily used with LED or CFL lamps. With more power-hungry incandescent lighting, the battery-backed adaptor wouldn’t supply emergency lighting for the required duration. But with LED or CFL lamps, emergency lights can last for as long as three hours.

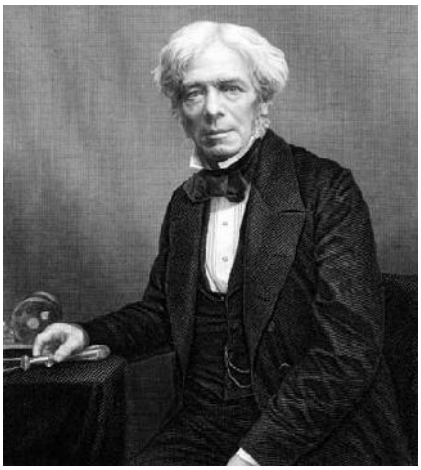
Still, the designers of the adapter faced a bigger challenge than simply building a socket that included batteries. The Switch Sense product, as the name implies, must detect the difference between a light switched being turned off and a building losing power. Indeed, the company said that an open light switch will not trigger the socket, but after a power failure you can still control the lamp, while on battery power, with a wall switch.

By,

Atul Krishna. S. P
Pre final EEE

PERSONALITY TO KNOW

Michael Faraday



Michael Faraday was born in Newington Butts, London on 22 September 1791. Due to the poor family background young Faraday had to largely educate himself. After studying the work of great scientists and authors he developed an interest in science, particularly in electricity. It was his early reading and experiments with the idea of force, that enabled him to make imperative discoveries in electricity later in life. Faraday was always extremely curious and inquisitive. At the age of twenty he began to attend lectures of different famous chemists in the quest to learn more. During this time he also applied for a job to Humphry Davy, his chemistry lecturer who later appointed him as Chemical Assistant at the Royal Institution in 1813.

After Davy retired in 1827, Faraday replaced him as lecturer of chemistry at the Royal Institution and published all his research work related to condensation of gases, optical deceptions and the isolation of benzene from gas oils. Faraday discovered and produced several new kinds of glass intended for optical purposes. Faraday is best recognized for his contributions to electricity and magnetism. He began experimenting with electromagnetism and by signifying the conversion of electrical energy into motive force, devised the electric motor. In 1831, Faraday discovered the ***induction of electric currents and constructed the first electric dynamo***. In 1839 he conducted several experiments to determine the fundamental nature of electricity and established that electrostatic force consists of a field of curved lines of force and conceived a specific inductive capacity. This led to the development his theories on light and gravitational systems. He later published two famous books are the **'*Experimental Researches in Electricity*'** and the **'*Chemical History of the Candle*.'** Faraday was a man of honor who was strong in his convictions. The great British scientist departed from this world on 25 August 1867.

Michael Faraday: ***"Nothing is too wonderful to be true, if it be consistent with the laws of nature"***

- M. Pranava Karthikeyan (Prefinal Year EEE)

APTITUDE-MAKE IT EASY!!

M.GENGARAJ
Assistant Professor/EEE

1. A can do a work in 15 days and B in 20 days. If they work on it together for 4 days, then the fraction of the work that is left is :

A. $\frac{1}{4}$ B. $\frac{1}{10}$

C. $\frac{7}{15}$ D. $\frac{8}{15}$

Explanation:

A's 1 day's work = $\frac{1}{15}$;

B's 1 day's work = $\frac{1}{20}$;

(A + B)'s 1 day's work = $\left(\frac{1}{15}+\frac{1}{20}\right)=\frac{7}{60}$.

(A + B)'s 4 day's work = $\left(\frac{7}{60}\text{ x }4\right)=\frac{7}{15}$.

Therefore, Remaining work = $\left(1-\frac{7}{15}\right)=\frac{8}{15}$.

2. In a certain store, the profit is 320% of the cost. If the cost increases by 25% but the selling price remains constant, approximately what percentage of the selling price is the profit?

A.30% B.70%

C.100% D.250%

Explanation:

Let C.P.=Rs. 100. Then, Profit = Rs. 320, S.P. = Rs. 420.
New C.P. = 125% of Rs. 100 = Rs. 125
New S.P. = Rs. 420.
Profit = Rs. (420 - 125) = Rs. 295.

∴ Required percentage = $\left(\frac{295}{420}\text{ x }100\right)_{\%}=\frac{1475}{21}$ % = 70% (approximately).

3. In how many ways can the letters of the word 'LEADER' be arranged?

A.72 B.144
C.360 D.720
E.None of these

Explanation:

The word 'LEADER' contains 6 letters, namely 1L, 2E, 1A, 1D and 1R.

$\therefore$ Required number of ways $= \frac{6!}{(1!)(2!)(1!)(1!)(1!)} = 360.$

4. A can contains a mixture of two liquids A and B is the ratio 7 : 5. When 9 litres of mixture are drawn off and the can is filled with B, the ratio of A and B becomes 7 : 9. How many litres of liquid A were contained by the can initially?

A.10 B.20
C.21 D.25

Explanation:

Suppose the can initially contains $7x$ and $5x$ of mixtures A and B respectively.

Quantity of A in mixture left $= \left(7x - \frac{7}{12}x\ 9\right)$ litres $= \left(7x - \frac{21}{4}\right)$ litres.

Quantity of B in mixture left $= \left(5x - \frac{5}{12}x\ 9\right)$ litres $= \left(5x - \frac{15}{4}\right)$ litres.

$\therefore \frac{\left(7x - \frac{21}{4}\right)}{\left(5x - \frac{15}{4}\right) + 9} = \frac{7}{9}$

$\Rightarrow \frac{28x - 21}{20x + 21} = \frac{7}{9}$

$\Rightarrow 252x - 189 = 140x + 147$

$\Rightarrow 112x = 336$

$\Rightarrow x = 3.$

So, the can contained 21 litres of A.

5. A train can travel 50% faster than a car. Both start from point A at the same time and reach point B 75 kms away from A at the same time. On the way, however, the train lost about 12.5 minutes while stopping at the stations. The speed of the car is:

A.100 kmph B.110 kmph
C.120 kmph D.130 kmph

Explanation:

Let speed of the car be $x$kmph.

Then, speed of the train $= \frac{150}{100}x = \left(\frac{3}{2}x\right)$kmph.

$\therefore \frac{75}{x} - \frac{75}{(3/2)x} = \frac{125}{10 \times 60}$

$\Rightarrow \frac{75}{x} - \frac{50}{x} = \frac{5}{24}$

$\Rightarrow x = \left(\frac{25 \times 24}{5}\right) = 120$ kmph.

6. Mr. Thomas invested an amount of Rs. 13,900 divided in two different schemes A and B at the simple interest rate of 14% p.a. and 11% p.a. respectively. If the total amount of simple interest earned in 2 years be Rs. 3508, what was the amount invested in Scheme B?

A. Rs. 6400
B. Rs. 6500
C. Rs. 7200
D. Rs. 7500
E. None of these

Explanation:

Let the sum invested in Scheme A be Rs. x and that in Scheme B be Rs. (13900 - x).

Then, $\left(\frac{x \times 14 \times 2}{100}\right) + \left(\frac{(13900 - x) \times 11 \times 2}{100}\right) = 3508$

$\Rightarrow 28x - 22x = 350800 - (13900 \times 22)$

$\Rightarrow 6x = 45000$

$\Rightarrow x = 7500.$

So, sum invested in Scheme B = Rs. (13900 - 7500) = Rs. 6400.

7. What was the day of the week on 17th June, 1998?

A. Monday
B. Tuesday
C. Wednesday
D. Thursday

Explanation:

17th June, 1998 = (1997 years + Period from 1.1.1998 to 17.6.1998)

Odd days in 1600 years = 0

Odd days in 300 years = (5 x 3) ≡ 1

97 years has 24 leap years + 73 ordinary years.

Number of odd days in 97 years (24 x 2 + 73) = 121 = 2 odd days.

Jan. Feb. March April May June

(31 + 28 + 31 + 30 + 31 + 17) = 168 days

$\therefore$ 168 days = 24 weeks = 0 odd day.

Total number of odd days = (0 + 1 + 2 + 0) = 3.

Given day is Wednesday.

8. In a box, there are 8 red, 7 blue and 6 green balls. One ball is picked up randomly. What is the probability that it is neither red nor green?

A. $\frac{1}{3}$
B. $\frac{3}{4}$
C. $\frac{7}{19}$
D. $\frac{8}{21}$
E. $\frac{9}{21}$

Explanation:

Total number of balls = (8 + 7 + 6) = 21.
Let E= event that the ball drawn is neither red nor green
= event that the ball drawn is blue.
$\therefore n(E) = 7.$

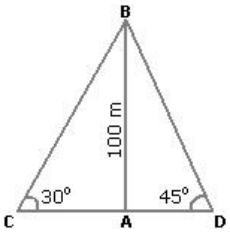
$\therefore P(E) = \frac{n(E)}{n(S)} = \frac{7}{21} = \frac{1}{3}$.

9. Two ships are sailing in the sea on the two sides of a lighthouse. The angle of elevation of the top of the lighthouse is observed from the ships are 30º and 45º respectively. If the lighthouse is 100 m high, the distance between the two ships is:

A. 173 m
B. 200 m
C. 273 m
D. 300 m

Explanation:

Let AB be the lighthouse and C and D be the positions of the ships.



Then, AB = 100 m, $\angle ACB = 30^\circ$ and $\angle ADB = 45^\circ$.

$\frac{AB}{AC} = \tan 30^\circ = \frac{1}{3} \Rightarrow$ AC = AB x 3 = 1003 m.

$\frac{AB}{AD} = \tan 45^\circ = 1 \Rightarrow$ AD = AB = 100 m.

$\therefore CD = (AC + AD) = (1003 + 100)$ m
= 100(3 + 1)
= (100 x 2.73) m
= 273 m.

10.Two students appeared at an examination. One of them secured 9 marks more than the other and his marks was 56% of the sum of their marks. The marks obtained by them are:

A.39, 30 B.41, 32

C.42, 33 D.43, 34

Explanation:

Let their marks be $(x + 9)$ and x.

Then, $x + 9 = \frac{56}{100}(x + 9 + x)$

$\Rightarrow 25(x + 9) = 14(2x + 9)$

$\Rightarrow 3x = 99$

$\Rightarrow x = 33$

So, their marks are 42 and 33.

CRACK GATE

1. Two independent random variables X and Y are uniformly distributed in the interval [–1,1]. The probability that max[X, Y] is less than 1/2 is
(A) 3/4 (B) 9/16 (C)1/4 (D) 2/3

Answer:B

2. The output Y of a 2-bit comparator is logic 1 whenever the 2-bit input A is greater than the 2-bit input B. The number of combinations for which the output is logic 1, is
(A) 4 (B) 6 (C) 8 (D) 10

Answer:B

3.The sequence components of the fault current are as follows: Ipositive = j1.5 pu, Inegative= –j0.5 pu, Izero = –j1 pu. The type of fault in the system is
(A) LG (B) LL (C) LLG (D) LLLG

Answer:C

4. The typical ratio of latching current to holding current in a 20 Athyristor is
(A) 5.0 (B) 2.0 (C) 1.0 (D) 0.5

Answer: Marks to all

5. The bridge method commonly used for finding mutual inductance is
(A) Heaviside Campbell bridge (B) Schering bridge
(C) De Sautybridge

Answer: A

6. An analog voltmeter uses external multiplier settings. With a multiplier setting of 20 kW, it reads 440 V and with a multiplier setting of 80 kW, it reads 352 V. For a multiplier setting of 40 kW, the voltmeter reads
(A) 371 V (B) 383 V (C) 394 V (D) 406 V

Answer:Marks to all

7. The locked rotor current in a 3-phase, star connected 15 kW, 4-pole, 230 V, 50 Hz induction motor at rated conditions is 50 A. Neglecting losses and magnetizing current, the approximate locked rotor line current drawn when the motor is connected to a 236 V, 57 Hz supply is
(A) 58.5 A (B) 45.0 A (C) 42.7 A (D) 55.6 A

Answer:Marks to all

8.A single phase 10 kVA, 50 Hz transformer with 1 kV primary winding draws 0.5 A and 55 W, at rated voltage and frequency, on no load. A second transformer has a core with all its linear

dimensions 2 times the corresponding dimensions of the first transformer. The core material and lamination thickness are the same in both transformers. The primary windings of both the transformers have the same number of turns. If a rated voltage of 2 kV at 50 Hz is applied to the primary of the second transformer, then the no load current and power, respectively, are
(A) 0.7 A, 77.8 W (B) 0.7 A, 155.6 W (C) 1 A, 110 W (D) 1 A, 220 W

Answer:B

9.A 220 V, 15 kW, 1000 rpm shunt motor with armature resistance of 0.25 W, has a rated line current of 68 A and a rated field current of 2.2 A. The change in field flux required to obtain a speed of 1600 rpm while drawing a line current of 52.8 A and a field current of 1.8 A is
(A) 18.18 % increase (B) 18.18 % decrease (C) 36.36 % increase (D) 36.36 % decrease

Answer:D

10. A cylindrical rotor generator delivers 0.5 pu power in the steady-state to an infinite bus through a transmission line of reactance 0.5 pu. The generator no-load voltage is 1.5 pu and the infinite bus voltage is 1 pu. The inertia constant of the generator is 5 MW-s/MVA and the generator reactance is 1 pu. The critical clearing angle, in degrees, for a three-phase dead short circuit fault at the generator terminal is
(A) 53.5 (B) 60.2 (C) 70.8 (D) 79.6

Answer:D

11. The slip of an induction motor normally does not depend on
(A) rotor speed (B) synchronous speed (C) shaft torque (D) core-loss component

Answer:D

12.In a D.C. shunt motor, speed is
(A)independent of armature current
(B)directly proportional to the armature current
(C)proportional to the square of the current
(D)inversely proportional to the armature current

Answer:A

13.The type of D.C. motor used for shears and punches is
(A)shunt motor
(B)series motor
(C)differentialcompoutid D.C. motor
(D)cumulative compound D.C. motor

Answer:D

14.If a D.C. motor is connected across the A.C. supply it will
(A)run at normal speed

(B)not run
(C)run at lower speed
(D)burn due to heat produced in the field winding by .eddy currents

Answer:D

15.In a D.C. shunt motor, under the conditions of maximum power, the current in the armature will be
(A)almost negligible (B)rated full-load current (C)less than full-load current
(D)more than full-load current

Answer:D

16.Differentially compound D.C. motors can find applications requiring
(A)high starting torque
(B)low starting torque
(C)variable speed
(D)frequent on-off cycles

Answer:B

17.The speed of a D.C. shunt motor more than its full-load speed can be obtained by
(A)decreasing the field current (B)increasing the field current (C)decreasing the armature current
(D)increasing the armature current

Answer:A

18.A direct on line starter is used: for starting motors
(A)iip to 5 H.P (B)up to 10 H.P (C)up to 15 H.P (D)up to 20 H.P.

Answer:A

19.By looking at which part of the motor, it can be easily confirmed that a particular motor is D.C. motor?
(A)Frame (B)Shaft (C)Commutator(D)Stator

Answer:C

20.These days D.C. motors are widely used in
(A)pumping sets
(B)air compressors
(C)electric traction
(D)machine shops

Answer:C

TIME TO KNOW OUR ALUMNI

Mr. Vinoth

Batch (2004 – 2008)

Driven by the desire to continuous growth and career development, I would like to pursue my career in digital marketing filed where my skills are best utilized in successful completion of assignments and be responsible to provide the team leadership and creativity.

Experience with Web site development HTML, content management system WordPress, work closely with the technical team to maintain site SEO standards .Building traffic, tracking site visitor's behavior, Analyze, Optimize, Reporting, A/B Testing. Proficient in communication Self Motivated Dedicated I like making new professional acquaintances. Reach out me for any career prospects. Specialties: HTML, JSP, Java Script, Site optimization for search engine(SEO), Google Analytics, Customer Support, Social Media Marketing, ITIL V3 Foundation certified.

Experience

Associate System Engineer-Sensiple

February 2013 – Present (1 year 6 months)Chennai Area, India Digital Analytics and Marketing Optimization, Google Web Analytics

Pre Click Marketing Optimization Site Audit SWOT Report(Grading based on Technical, Yslow, Marketing, Ecommerce) Keyword Research & Analysis Content Optimization Site Optimization for Search Engine Google, Bing, Yahoo Link Building (Syndicate content for Multiple Channels in multiple format, RSS Submission, Directory Submission, Blog Submission, Document Submission) Social Media Optimization-(Facebook, Twitter, Google Plus, Pinterest, Linkedin, Squidoo Lens, Hub Pages) Online Public Relation-(Article Submission, Press Release Submission) Google Webmaster Tool Bing Webmaster Tool XML Sitemap creation and Submission

Post Click Marketing Optimization Landing Page Optimization A/B Testing Multivariate Testing Post Conversion Marketing Optimization Email Marketing Auto-responder Optimization Lead Scoring Lead Nurturing Report SERP , Optimization and Analytics Report

Associate Support Engineer-Sensiple

February 2011 – January 2013 (2 years) Chennai Area, India

Production/IVR Application ITIL Support,IT Service support,service delivery,Linux and windows platform deployments. Provide primary support and maintenance for the Interactive Voice Response (IVR) applications.

Worked closely with Application Development team,System Administrators and other teams to coordinate for all activities and work to debug issues. Respond to emails and join the bridge over phone. Server reboot & Dashboard Monitoring.

Troubleshoot and resolve incidents & service requests from end users. Appropriately categorize, prioritize and escalate incidents and service requests to Tier 2 which we cannot resolve.To check CVS AOOR, CVS ORRTS, SVU Order ready,T Mobile input file and import progress in all campaigns Experience of ITIL Service Support and Delivery process. ITSM Tool Service Desk. File upload in FTP using FileZilla,WINSCP

Customer Support Executive-Padmam Technologies

March 2010 – June 2010 (4 months) Chennai Area, India

UK outbound cold calling to make customers subscribe the technical support for Computer provided by the client.

Programmer Analyst-EntitleTech Solutions Pvt Ltd

December 2008 – September 2009 (10 months)Chennai Area, India

Over Eight Months of experience in developing engineering software applications for Automobile, Educational organizations using Java, Servlets, JSP,JAVA Script,Net Beans,Tomcat, Spring MVC Framework,MY SQL.Windows XP

FUN COURT

RIDDLES:

1. The shorter I am, the bigger I am. What am I?
2. What has ten letters and start with gas?
3. There are five people at a table and a pie sliced into 5 pieces. Each person has a piece of pie in front of them, yet the pie tin still has a piece of pie in it. How is this possible?
4. Does an ounce of gold or an ounce of feathers weight more?
5. When you bend me I'm kind
   But I'm very hard to find
   I'm easily sold
   and rhyme with this when told!!!! Who am I?
6. To dye a single Easter egg takes 7.5 minutes if you leave it in dye. How long would it take to dye 3 eggs?
7. What word links these images?
8. The person who buys me doesn't need me, the person who makes me doesn't want me, and the person who uses me can't appreciate me.What am I?
9. Scientists are trying to figure out what is between Heaven and Earth.What is it?
10. Can you name three consecutive days without using the words Wednesday, Friday, or Sunday?

ANSWERS:

1. Temper
2. Automobile
3. One of the people at the table has the pie tin with a piece of pie in it in front of them.
4. The gold weighs more. In avoirdupois weight (feathers are measured in this way), one ounce = 437.5 grains. In troy weight (gold is measured in this way), one ounce = 480 grains.
5. Gold
6. 7.5 minutes. Do them all at once.
7. Falls
8. Coffin
9. And
10. Yesterday, today and tomorrow.

DO IT!!! KNOW IT!!!

Anto Sharon Prakash.A, Pre final year – 'A'

Generating our own electricity:

Everyday we come across several electrical appliances. They are used for different purposes. But they depend upon a common thing 'electrical power'. We know about the generation of electric power. But have anyone thought of making it in our own? Let us try it now. For this we require

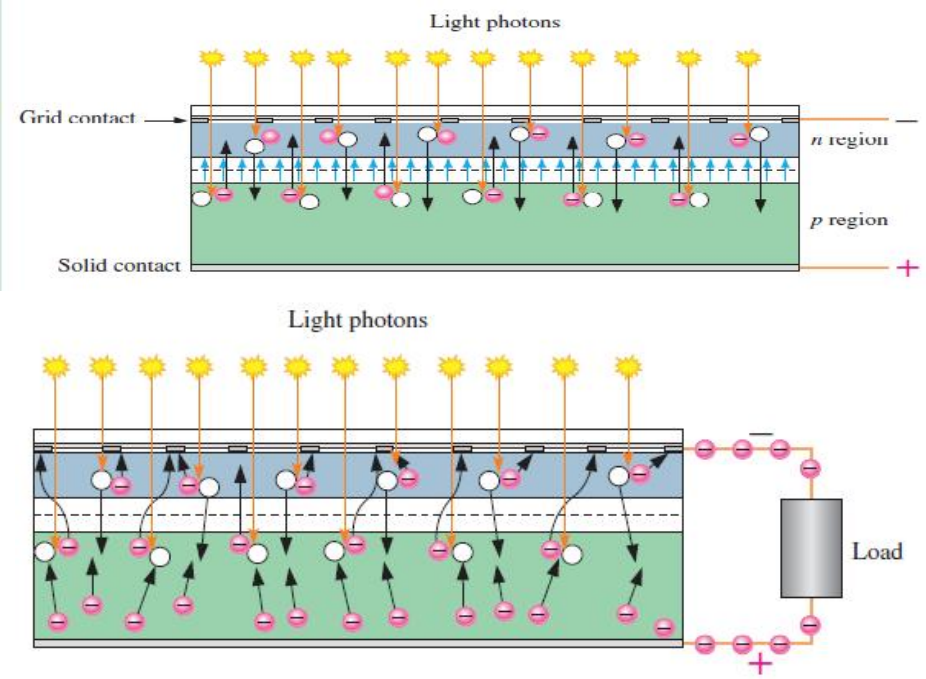
1. Photovoltaic cell
2. Conducting wires
3. Battery
4. LEDs
5. Diodes
6. Resistor
7. Multimeter

Selection:

The selection of solar power as source of energy would amaze us that why solar has been chosen. We would think it as simple. But how many of us have tried this simple experiment?. And also work on solar power would improve green earth movement and make us to engage in research activities dealing with lowering the cost of photovoltaic cells which costs high now.

Principle behind :(written by Thomas L.Floyd)

Sunlight is composed of photons, or "packets" of energy. There is sufficient solar energy striking the earth each hour to meet worldwide demands for an entire year. The *n*-type layer is very thin compared to the *p* region to allow light penetration into the *p* region. The thickness of the entire cell is actually about the thickness of an eggshell. When a photon penetrates either the *n* region or the *p*-type region and strikes a silicon atom near the *pn* junction with sufficient energy to knock an electron out of the valence band, the electron becomes a free electron and leaves a hole in the valence band, creating an *electron-hole pair*. The amount of energy required to free an electron from the valence band of a silicon atom is called the band-gap energy and is 1.12 eV (electron volts). In the *p* region, the free electron is swept across the depletion region by the electric field into the *n* region. In the *n* region, the hole is swept across the depletion region by the electric field into the *p* region. Electrons accumulate in the *n* region, creating a negative charge; and holes accumulate in the *p* region, creating a positive charge. A voltage is developed between the *n* region and *p* region contacts.

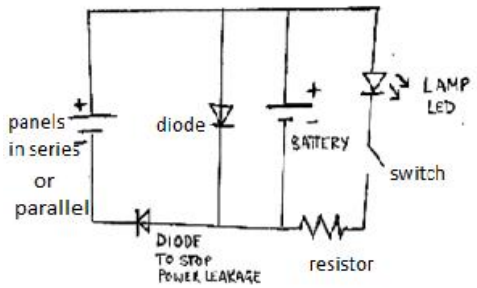


When a load is connected to a solar cell via the top and bottom contacts, the free electrons flow out of the *n* region to the grid contacts on the top surface, through the negative contact, through the load and back into the positive contact on the bottom surface, and into the *p* region where they can recombine with holes. The sunlight energy continues to create new electron-hole pairs and the process goes on.

What we are going to do?

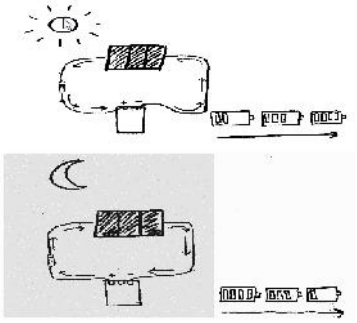
1. Try out the connections of PV cells in series.
2. Try out the connections of PV cells in parallel.
3. Analyse the voltage and current variations when connecting the PV cells in series and parallel.
4. Analyse the whole circuit and its components.

Circuit:

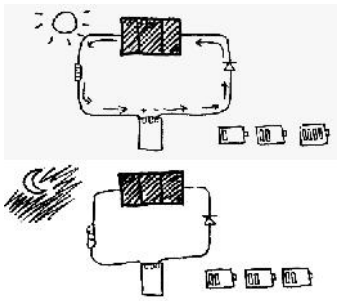


Circuit components explanation:

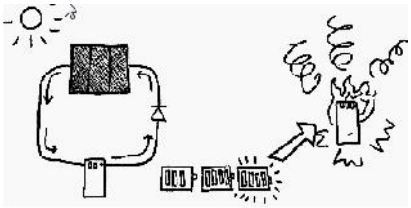
Batteries like lithium ion should not be overcharged. If overcharged, there is a chance of getting fire and burst. Batteries get charged in sunlight . Discharge in darkness

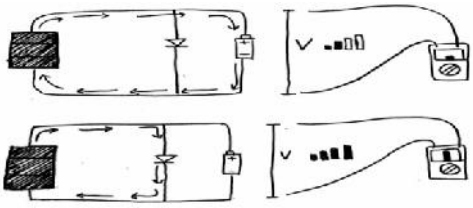


Diode is added to rectify the above said problem.



Battery gets fire due to over charging.





Diode is added parallel to prevent over charging

Before breakdown voltage of diode ,it is open circuited. Only voltage appears. After reaching breakover voltage it is short circuited.The current does not pass through the battery and the voltage across diode only appears in battery as voltage same in parallel condition. If battery capacity is 5V then the diode should have turn on voltage of 5V. Multiple diodes can be connected in series across battery if the required voltage is not met.

Note:

1.The circuit component parameters are left intentionally to let thy design. So a clear idea about PV cells would be made possible.

2.Thy is always recommended to have multimeter. It is not only used here but also for many purposes. Voltage and current variations can be easily analyzed.

3.Use multisim software to simulate the circuit with values at first and then buy the hardware components and try with it.

Have you made the LEDs to glow?What have we learnt at the end of experiment?Try to answer these questions.

INDUSTRY PROFILE

Voltas is India's largest air conditioning company, and one of the world's premier engineering solutions providers and project specialists. Founded in India in 1954, Voltas Limited offers engineering solutions for a wide spectrum of industries in areas such as heating, ventilation and air conditioning, refrigeration, electro-mechanical projects, textile machinery, mining and construction equipment, water management & treatment, cold chain solutions, building management systems, and indoor air quality.

The Company has ISO 9001 - 2000 standards certification in its projects businesses, and has successfully undertaken and executed prestigious high-value projects in the Middle East, Far East and South East Asia, CIS countries, Africa and India.

Voltas' sales and service operations in-house manufactured products, including air conditioning equipment, materials handling and warehousing solutions, and unitary cooling products
- products of principals represented, including textile machinery, warehousing and cargo handling equipment, and mining and construction equipment. In all these sectors, the company demonstrates its specialised engineering expertise, as well as its extensive network for global sourcing.

Electro-Mechanical Projects & Services
- Electrical, Mechanical & Refrigeration Solutions
- Electrical & Mechanical Solutions (international)

Engineering Products & Services
- Textile Machinery
- Mining & Construction Equipment

Unitary Cooling Products
- Air Conditioners
- Commercial Refrigeration
- Water Coolers & Dispensers

Company Details:

- **Voltas Engineering company**
- **Voltas Limited is an engineering, air conditioning and refrigeration company based in Mumbai, India. Wikipedia**
- **Customer service: 1800 425 4555**
- **Stock price: VOLTAS (NSE) Rs. 191.05 -1.20 (-0.62%)**
- **1 Aug 11:47 am IST - Disclaimer**
- **Headquarters: Mumbai, Maharashtra, India**
- **CEO: Sanjay Johri**

Memorable Moments

During "MATLAB Software" class for III Year students handled by Dr.M.Willjuice Iruthayarajan, Professor & Head/EEE

During EEE Association Inaugural Function

During Special Interest Group (SIG) – Liquid Dielectrics for III and IV year students, handled by Mr.P.Samuel Pakianathan, AP/EEE

EEE NEWSLETTER

PATRON

ThiruK.R.Arunachalam, Member, Managing Committee

CO-PATRONS

Dr.Kn.K.S.K.Chockalingam, Director

Dr.S.Shanmugavel, Principal

CONVENOR

Dr.M. Willjuice Iruthayarajan, Prof & Head/EEE

STAFF ADVISORY COMMITTEE:

1. Mrs. R.V.Maheswari, Associate Professor
2. Mr. B.Vigneshwaran, Assistant Professor
3. Mr. S. Thirumalai Kumar, Assistant Professor

EDITORIAL COMMITTEE

EDITORS:

- Mr.A.Venkat Subramanian (Final Year EEE)
- Mr.N.ArunKumar (Final Year EEE)
- Ms.A.MuthuMeenaSundari (Final Year EEE)
- Mr.M.PranavaKarthikeyan (Prefinal Year EEE)
- Ms.M.Manogari (Prefinal Year EEE)

REPORTERS:

- Mr.S.Ahamed Ibrahim (Final EEE)
- Mr.K.S.Vignesh (Final EEE)
- Ms.M.S.Archana (Final EEE)
- Mr.M.Gurusamy (Prefinal Year EEE)
- Mr.R.UmaMaheswaran (Prefinal Year EEE)


DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING