Kolhapur Institute of Technology's College of Engineering (Autonomous),Kolhapur
'A' Grade by NAAC WITH CGPA 3.12

September 2021 Edition

ELECTRO-TALK

E-Newsletter of Department of Electrical Engineering,KITCoEK

Inside this Issue

World Advancements in Electrical Engineering

Fraunhofer ISE Sets New World Record of 26 Percent Efficiency for Both-Sides-Contacted Solar Cell

A team of researchers led by Dr. Armin Richter of the Fraunhofer Institute for Solar Energy Systems ISE achieved a record conversion efficiency of 26.0% for both sides contacted silicon solar cells. In the recently published Nature Energy article "Design Rules for High-Efficiency Both-Sides-Contacted Silicon Solar Cell with Balanced Charge Carrier Transport and Recombination Losses". Richter explains the structure of the record-breaking cell and presents fundamental design-related aspects leading to even higher efficiencies. The design of the back-side cell surface as a full-area charge-carrier collecting passivating contact was key to the success.

The basis for the record, the cell is the TOPCon technology (Tunnel Oxide Passivating Contact). Developed at Fraunhofer ISE, which combines the advantages of very low surface recombination losses with efficient charge carrier transport. This TOPCoRE cell (TOPCon Rear Emitter Solar Cell) allows higher voltages and higher fill factors than cells with a collecting emitter on the front side.

With this cell design, the wafer can be better utilized for charge carrier transport and the front side is more effectively passivated, for which aluminium oxide is used. Detailed power loss analysis shows that this cell generally compensates for and minimizes both electron and hole transport losses as well as transport and recombination losses.

Explained By Experts

Explained by Experts is a column wherein experts from their respective fields explain their field and the bring out the best information.

In this edition we have our honorable Head of the Department, Prof. & Dr. Vilas Bugade write on what is electrical engineering.

Dr. Vilas S. Bugade,

Professor & Head,

Electrical Engineering Department,

KIT's College of Engineering

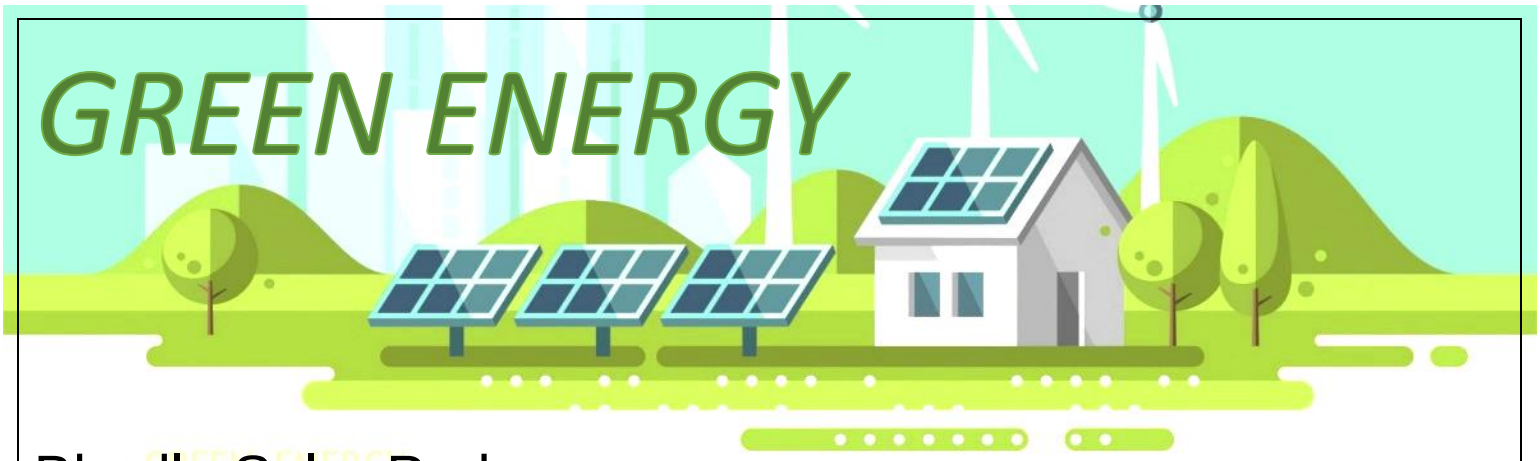
(Autonomous), Kolhapur

Electrical engineering is an engineering course disturbed with the study, design and application of equipment, devices and systems which rehearsal electricity, electronics, and electromagnetism. It emerged as an identifiable occupation in the latter half of the 19th century after commercialization of the electric telegraph, the telephone, and electrical power generation, distribution and use.

Electrical engineering is now divided into a wide range of different fields, including computer engineering, systems engineering, power engineering, telecommunications, radio-frequency engineering, signal processing, instrumentation, electronics, and optics and photonics. Many of these disciplines overlap with other engineering branches, spanning a huge number of specializations including hardware engineering, power electronics, electromagnetics and waves, microwave engineering, nanotechnology, electrochemistry, renewable energies, mechatronics, and electrical materials science.

Electrical engineers typically hold a degree in electrical engineering or electronic engineering. Practising engineers may have professional certification and be members of a professional body or an international standards organization. These include the International Electro Technical Commission (IEC), the Institute of Electrical and Electronics Engineers (IEEE) and the Institution of Engineering and Technology (IET) (formerly the IEE). Electrical engineers work in a very wide range of industries and the skills required are likewise variable. These range from circuit theory to the management skills of a project manager. The tools and equipment that an individual engineer may need are similarly variable, ranging from a simple voltmeter to sophisticated design and manufacturing software.

Power & Energy engineering deals with the generation, transmission, and distribution of electricity as well as the design of a range of related devices. These include transformers, electric generators, electric motors, high voltage engineering, and power electronics. In many regions of the world, governments maintain an electrical network called a power grid that connects a variety of generators together with users of their energy. Users purchase electrical energy from the grid, avoiding the costly exercise of having to generate their own. Power engineers may work on the design and maintenance of the power grid as well as the power systems that connect to it. Such systems are called on-grid power systems and may supply the grid with additional power, draw power from the grid, or do both. Power engineers may also work on systems that do not connect to the grid, called off-grid power systems, which in some cases are preferable to on-grid systems. The future includes Satellite controlled power systems, with feedback in real time to prevent power surges and prevent blackouts.



Bhadla Solar Park

Bhadla Solar Park is the largest solar park in the world as of 2020.

The park has a total capacity of 2245 MW. In September 2018, Acme Solar announced that it had commissioned India's cheapest solar power. The park has a **total capacity of 2245 MW**. In December 2020 park reached the lowest bid of Rs2.44 per kilowatt-hour.

Officially recognized as a sandy, dry, and arid region with an area of about 45 km2 (17 sq mi), Bhadla is located about 200 km (120 mi) north of Jodhpur and about 320 km (200 mi) west of the state capital Jaipur.

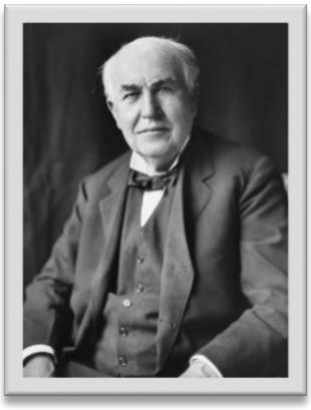
The region has been described as "almost unlivable" due its climate.

Average temperatures in Bhadla hover between 46 and 48 °C (115 and 118 °F), with hot winds and sand storms occurring frequently.

The nearest habitation to Bhadla is the village of Bap located about 50 km (31 mi) away, and the closest urban area – a tehsil town called Phalodi – is situated 80 km (50 mi) away

Prominent Scientist: **Thomas Edison** (1847 – 1931)

"Our greatest weakness lies in giving up. The most certain way to succeed is always to try just one more time."



Thomas Edison was an American inventor who is considered one of American's leading businessmen and innovators. Edison rose from humble beginnings to work as an inventor of major technology, including the first commercially viable incandescent light bulb.

Edison was born on February 11, 1847, in Milan, Ohio. (USA). Edison began working at an early age, he took a job as a selling newspapers on local railroad While Edison was not the inventor of the first light bulb, he came up with the technology that helped bring it to the masses.

During his lifetime, Edison received 1,093 U.S. patents and filed an additional 500 to 600 that were unsuccessful or abandoned.

Aptitude Corner

Q.1] 5 men and 10 boys can do a piece of work in 30 days and 8 men and 12 boys can do the work in 20 days then the ratio of daily work done by a man to that of the boy.

A) 6:1

B) 7:3

C) 4:5

D) 5:1

Q.2] Which is the odd term in the following series?

CMQ, FPT, JTX, OYC, UFI

A. FPT

B. OYC

C. JTX

D. UFI

Solutions to the Aptitude questions.

A.1] Explanation: **(A)6:1**

5m + 10b = 1/30 and 8m + 12b = ½. Hence, the ratio of daily work done by a man to that boy is 6:1.

A.2] Explanation: **(D)UFI**

CMQ: The difference between C and M is 10. The difference between M and Q is. Use the similar technique for further options & you will get the answer.

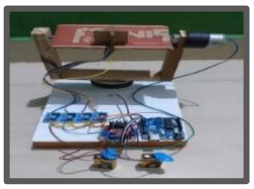
Projects by Students

Dual Axis Solar Tracker Using Arduino

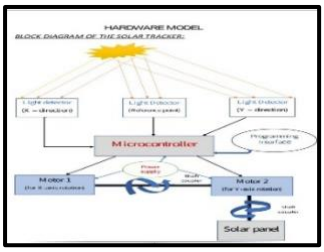
In the past decade of years there is increase in demand for reliable and abundant electrical energy derived from renewable energy sources renewable energy plays important role in energy crisis of country.

One such example of renewable energy is solar power. Solar energy is a very large, inexhaustible source of energy. The reason is sun is only source we can find anywhere. The solar power received by the earth is approximately 1.8*1011MW. The system will tend maximize the amount of power Absorbed by Photo voltaic systems. It has been found that making the use of a Dual axis tracking system, can increase the power output by 40%-60%.

The proposed following framework does following of daylight all the more adequately by giving PV board revolution in two diverse pivot.



DC engines are essentially performing capacity of sun following. In the past decade of years there is increase in demand for reliable and abundant electrical energy derived from renewable energy sources renewable energy plays important role in energy crisis of country. LDR sensor sense the light and sends flag to microcontroller. Microcontroller is doing correlation of signs got from LDR sensors and based on more grounded signals it is choosing pivot heading of dc engine. Double hub tracker control is clarified with the assistance of piece chart appeared in figure.



Based on light force contrast on sensor, controller enacts driver circuit and moves dc Motors new position where light falling on sensor sets is same. A similar procedure is keep on with on changes suns area in the sky. Therefore, this proposed demonstrate can catch more sun beams and frameworks sun powered vitality transformation ability is enormously improved.

The more you explore, the more you grow

Useful Links

- **Electrical With Abhishek Joshi -** Learn Electrical concepts in simplest way.
  https://www.youtube.com/channel/UC0SXu7VFJG5CmT4o2h87ocA/featured
- **Electro Boom-** learn subconsciously while being entertained**.**
  https://www.youtube.com/user/msadaghd
- **Electrical 4U -** A study site created by experienced engineers in order to help their fellow colleagues.
  https://www.electrical4u.com
- **Electronics-** If there is something you didn't understand in class – no worries, Electronics has got you covered.
  http://electronics.wisc-online.com/

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Newsletter Committee

Inside this Issue

End Sem Exams Are Approaching !

HOW TO PREPARE FOR END SEMESTER EXAMINATIONS ?

From the Desk of Chief Editor:
Mrs. Sushmita A. Sarkar,Asst.Professor.

As exams are nearing by, so I am here with guidelines for it. I am sure if you follow this guidelines then you will surely succeed :

1)**Make a time table,** this will help you to construct your study habit with punctuality.

2)Be curious and attentive in class as this would help you to resolve most of your queries. **So missing the classes is a big NO-NO advice to all the students.**

3)**Seek guidance from Faculty members** for clearing doubts.We the Teachers ,feel happy to help you.

4)**Prepare notes,**a short note will always help you to recall the lectures. Don't try to memorise everything in your class.

5)**Group study is a powerful concept** as you can solve your queries as well as teach others. So isn't it unique!!!!!

6)**Help your friends** to study any concept which he or she doesn't understand. This would additionally help you prepare for semester exams.

7)**Choose your favourite section from which questions appear** in the semester exam,and prepare accordingly.

8)**Take a self-test** on any section which you have prepared by this time. This process would help you to manage your time wisely at the time of examination and also boost your strength.

9) **Revision before the exam**, where I'd suggest going through all the sections once before the exams and the areas you are weak in, revise them twice.Please make sure that you finish your exam preparation a day before the exam.

10)**Find relaxation time for yourself** rather than being in a hassle just before the exam without any late night study.

11)**Listen to music,**involve yourself in daily physical activities most importantly take good care of your health.Mental and physical wellbeing are the keys to your success.

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In this edition we have Priyanka Kulkarni, Associate Professor write on Electric Vehicle penetration in India.

Priyanka Kulkarni,

Associate Professor ,

Electrical Engineering Department,

KIT's College of Engineering

(Autonomous), Kolhapur

Electric Vehicle penetration in India- Facts and challenges

Currently, e- mobility is a buzz word in the automobile industry. The industry as well as customers are curious about the prospects in e-mobility and the government's approach towards this field and so are the engineers aspiring for a career in electric vehicle domain as an employee or a start-up owner. An overview of electric vehicle (EV) penetration in India will enlighten all these stakeholders.

The physical ecosystem of e-mobility in India:

It consists of -

1.Electric power generation (typically renewable power plants such as solar and wind), transmission, distribution.

2. Charging station or a household charger. The EV customer uses the power through a metered smart charging or the network provider gives service through online booking etc.

Problems in the physical ecosystem in India:

1.Distribution companies (DISCOMs) are not economically strong. Hence, once a charging station requirement is identified, there is a lot of delay by them to actually set up a charging station.

2. The DISCOMs may have planned the distribution substations in an area for a low level of load. So, a new line may be necessary to be laid up to the proposed charging station.

3. At present, there is a state govt control on distribution of electric power. There is a little freedom of metering and selling power. To overcome this problem, now the Ministry of Power has declared that charging stations will be interpreted as service providers and not as a seller of power.

The technology ecosystem of e-mobility in India:

E-mobility is an evolving scenario, the technology is not mature or stabilized. In e-mobility, a lot of day-to-day research is taking place. The gap between continuously evolving technology and productizing it has to be bridged by academicians and research institutes. The industry and users will get benefitted by them. To eliminate India's dependency on other countries for Lithium in Li ion battery and rare earth magnet materials, research is going on at various IITs about sodium ion battery, metal air battery, switched reluctance motor and axial flux motors. The e-mobility industry will mature after approximately 15 years. The technology readiness levels for any industry are defined as follows

TR1-Basic Research of material or manufacturing Process

TR2-Applied research- Potential to satisfy a technical need

TR3-Critical function- Initial Lab values validate predictions of separate elements of the technology

TR4-Alpha Protos testing for the function

TR5- Beta Protos with simulated service conditions- Tech issues with Lab scale proto retired.

TR6- Material process- proto validation and product design completed, All engineering risks across life cycle retired.

TR7- Pilot production process- product integration and optimization, R&D and technology development completed.

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TR8- techno economical evaluation in the market. Pre commercial demonstration.

TR9- Commercial production

Earlier, for other industries, the Indian industries started around level TR6. But this time, the government has presented such a structure for promotion of e-mobility that the industries actually work across all these levels and there is a good coordination between all levels. However, the rate of the work at all levels is not yet appreciable.

EV penetration in India:

Presently, in India, EVs are being manufactured in all sectors like low voltage 2-W and 3-W, high voltage 4W (Light commercial vehicles LCV, passenger cars, buses and trucks). EV penetration is the % of EVs out of the total vehicles in each sector and how fast will this % share increase? EV penetration is a very important commercial criteria for industry. They estimate demand for electric items and they will produce according to the penetration, in order to avoid blocking of the investment and wastage of time before production. It also helps them to decide the prices.

Govt subsidy/incentives will be helpful to familiarize the technology, but it will not change the market behavior i.e. it will not drive adoption. The transition from ICEV to EV and hence the market behavior solely depends on –

1. Government regulation/law- Whether the government bans buying and registering of ICEV, in a step-by-step mode?

2. Capital cost and available finances- Capital cost should come down. Battery is the costliest item in an EV. So effective battery cost should come down. Finance should be available for vehicles in all sectors. Banks are not financing EV very well. (e.g. e-auto) To overcome this problem, the government is going to set up a new organization for lending and financing/ funding e-mobility ecosystem. Such a risk enablement, where the government takes the risk in the initial stage until the policies to finance are revised as per the need and finally are mature. Then the private sector funding agencies follow and enable the growth in the sector.

3. Total cost of ownership TCO- This in turn depends on interest rates of loans taken to purchase an EV costlier than the ICEV and the vehicle running per day and its mileage. The amount of increase in EMI is balanced by saving in the fuel cost per month

4. Sufficient charging infrastructure to offer convenience of charging- This is necessary to solve the range problem necessary to fulfill daily transit target.

Transition timeline:

In most of the north Indian cities (e.g. Delhi and all big cities), the transition of 3-W rikshaws from ICE-rikshaw to e-rikshaw is already complete by 2020 and the penetration is almost 100%. But it is yet to pick up in southern India.

3-W (commercial or passenger) transition has started from 2021. Penetration will increase slowly.

2-W retail will make transitions from 2022. On Average 2-W runs 25km per day. Hence the capital cost should further decrease.

4-W fleet (e.g. taxies run by OLA, Uber). Their running is more. So in 2022, for them the EV technology has become profitable. But the no. of such 4W fleet is only 2-4% of total 4-W.

Light commercial vehicle (e.g. Tata Ace etc.) Their running is 140-150 km/day. From 2024, this market will make transition. However, a small part of commercial vehicles (e.g. vegetable supply vehicles, aviation fuel from refineries to airport) has already started transitioning.

Buses will make transition from 2025. In India, before COVID, around 40000 buses were sold per year. Out of these, around 10%-15% are city buses and the major % is school bus, staff bus and long route buses. Staff bus runs 60 -100km/day, school bus runs 30-40km/day. Hence, the e-bus model is not viable for them yet. Moreover, today, the government gives subsidy only to City Transport and State Transport undertakings for e-buses. Hence, there are occasional e- bus procurements from them in a few thousands. But the number is not yet attractive for OEMs.

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4-W retail i.e. private will make transition from 2027 (It also depends on charging infrastructure)

Long distance Trucks will make transition from 2030

To complete the transition of all vehicles, the OEMs and researchers, financers and the government all have to work a lot.

EV penetration projected on 2025:

2-W (5-16%), 3-W e-rikshaw (33-50%), 3-WAuto (15-33%), 4-W (2-5%), LCV (2-7%), Bus (9-14%), Truck (0-0.5%)

Challenges for automotive OEM:

1. Indian weather conditions are different from that in China or Europe. E.g. mansoon downpour, frequent flooding, dust storms in northern India will ruin aggregates of the vehicle causing abrasion. Peninsular India has humidity problem. City traffic in India is worse, It needs inch by inch advancement), inching traffic up fly overs with overloads, some road/terrain quality is very bad- not as per international standard. The vehicle parts should sustain in these harsh conditions.
2. Government schemes and regulations are announced very late- just before implementation. So, the OEM don't get enough time to plan and produce. OEM need govt to announce the regulations early (more than 1 year early), and provide a long time margin for fulfilling (e.g. 2-3 years)- so that industry and consumers get ready.
3. Tailor made tenures for loans are necessary for EVs.

Opportunities for engineers:

The industry needs expertise in following domains.

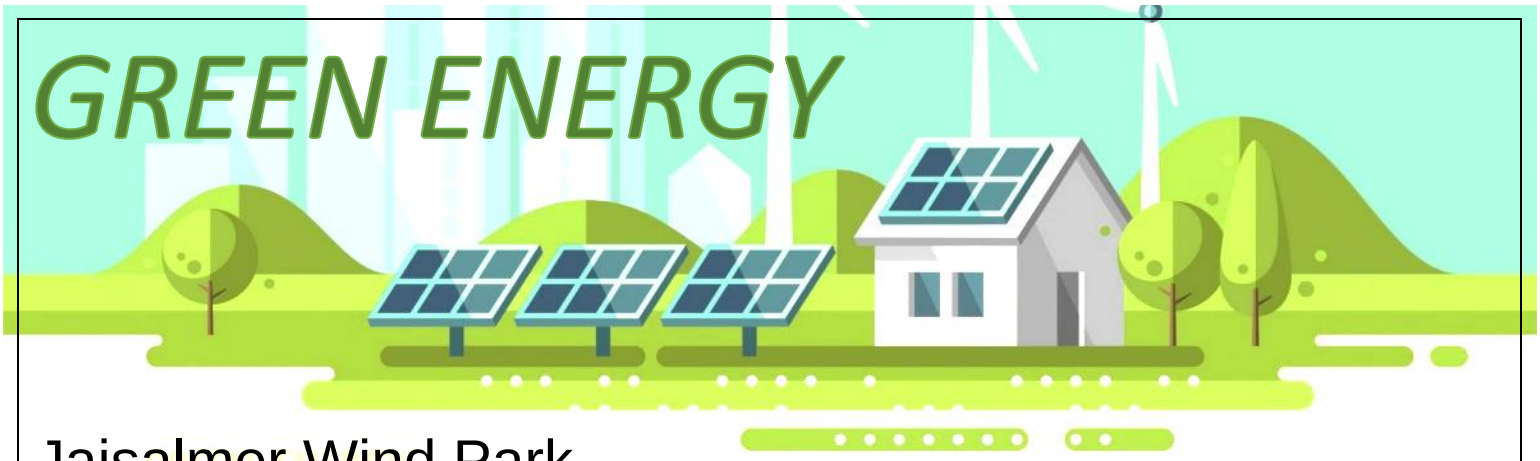
Charging infrastructure- Power electronics, connected vehicles, power distribution, mobility planning, electromagnetism, EMI, EMC

Energy Storage System- Electro chemistry (battery), thermal management, micro electronics, power electronics, electrical and thermal efficiencies, material science and metallurgy

Propulsion system- Electric machines, control algorithms, power electronics, micro electronics, thermal management, vehicle engineering, electrical engineering

More the competence of an engineer, better is the employability and research is more lucrative. After 5 years, the industry will need absolutely seasoned professionals who are able to work in the domain independently. Some industries are re-training their employees in automotive. Thus, talent pool is being created in the country.

GREEN ENERGY



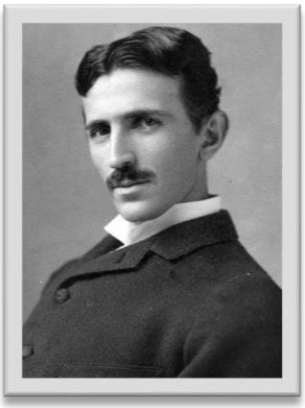
Jaisalmer Wind Park

The Jaisalmer Wind Park is India's Second Largest and globally the Fourth Largest operational onshore wind farm. This project is located in Jaisalmer District, Rajasthan, Western India. The project was initiated in August 2001 by developed by Suzlon Energy and comprises Suzlon's entire wind portfolio ranging from the earliest 350 kW model to latest S9X – 2.1 MW series

Type of this wind Farm is Onshore . Its installed Capacity is 1064 MW, Which makes it one of the world's largest operational onshore wind farms. This park develop 1600MW energy. By April2012, its combined installed capacity crossed 1000MW i.e., 1GW . at 1064 MW , the wind park became the largest of its kind of India, and one of the largest wind farm in the world .In 2015, 24 wind turbine generator of 2.1MW each were installed at Tejuva, taking the overall production to1300 MW.

Prominent Scientist: **Nikola Tesla** (1856 – 1943)

"If you want to find the secrets of the universe, think in terms of energy, frequency and vibration."



Nikola Tesla (10 July 1856 – 7 January 1943), was a ethnic-Serbian inventor, electrical engineer, mechanical engineer and physicist. He is best known for his contributions to the design of the modern alternating current (AC) electricity supply system. He was born in the village of Smiljan, in the part of former Austria-Hungary that is now Croatia.

He later became an American citizen.Tesla got his first job in Budapest in 1882, working at a telephone company. A few years later he moved to the United States. Even in his early life, he was inventing things. His best known invention was an electric motor that could run well on AC power. Tesla died of coronary thrombosis in a hotel room in Manhattan, New York City on 7 January 1943.

Aptitude Corner

Q.1] 5 men and 5 women can build a room in 6 days. 8 men and 3 women will take 5 days to complete the same piece of work. How many days will 6 men and 1 woman take to complete twice the job?

A) 10 Days.

B) 15 Days.

C) 13 Days.

D) 12 Days.

Q.2] Rs.6000 amounts to Rs.7986 in 3 years at CI. What is the rate of interest?

A. 10%

B. 20%

C. 6%

D. 8%

Solutions to the Aptitude questions.

A.1] (C) 13 Days.

A.2] (C) 6%

Projects by Students

Automatic Voltage Stabilizer

In India, Large power distribution systems are installed with large power distribution losses and also power supply changes according to uses which results in variation of voltage in Industrial and domestic use, which may damage electrical appliances like Refrigerator, AC, Water pump, Heater. This happens due to Phase unbalance, Harmonic Distortion, using undersized wires, load on distribution transformer or due to overvoltage.

To overcome this problem voltage stabilizer can be used, it bucks or boosts the voltage as per input voltage given to system. We are using electronic components like bridge rectifier, comparators and switching circuit using transistor.

Working is based on comparing input voltage and switching circuits, transistor which is connected to 6 tapped transformer making of 180 to 270 V of tapping to boost or Buck voltage.
First voltage will be rectified through bridge rectifier and compared low or high through comparator considering a reference voltage and then signal will be send to switching circuit to turn on or off respective transistor then using UPS same signal will get transferred to transformer and voltage will be Bucked or boost between tapping of 180 to 270 volts which will give a constant output voltage.
By using this method we can get regulated output voltage even if input voltage is unstable.

The more you explore, the more you grow

Useful Links

- **Hackaday –** Find Popular technical Blogs, Videos and webinars
  https://hackaday.com/about/
- **Circuit Lab –** Circuit lab allows to simulate circuits and schematic with their easy to use platform.
  https://www.circuitlab.com/
- **Makezine –** If you are unsure about a project check this website out.
  https://makezine.com/
- **Electrical Engineering Portal-** Guides to using electrical software, even research papers - a great public resource for all.
  https://electrical-enegineering-portal.com/

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Inside this Issue

Departmental Acheivements

MoU Signed between Dept. of Electrical Engineering & Kolhapur-Sangli Sub-Center, MSEDCL Training and Safety Center, Ekalhare-Nashik.

12-01-22

A Memorandum of Understanding (MoU) was signed between the Department of Electrical Engineering, KIT Engineering College and Kolhapur-Sangli Sub-Center, MSEDCL Training and Safety Center, Ekalhare-Nashik. On behalf of MSEDCL, Chief Executive Engineer Ankur Kawale and Deputy Executive Engineer Ratnakar Mohite & In-charge Director of KITCOE(A)K Manoj Mujumdar signed the agreement. For this MoU, Divisional MSEDCL Training Center, Deputy Executive Engineer of Sangli Division Mrs.S.G Joshi and R.H Pawar cooperated

The MoU has created an opportunity for coordination between educational institutions and government institutions. Prof. Priyanka Mane will be working as the MoU coordinator of Department of Electrical Engineering.

Students will have the opportunity to work on new projects in MSEDCL, technical and software training, through college professors of various schemes and internships in other schemes.

Present in the photograph are, the head of the Department of Electrical Engineering, Dr. Vilas Bugde, Prof. Priyanka Kulkarni was also present.

KIT's President Sunil Kulkarni, Vice President Sajid Hudali, Secretary Deepak Chougale provided guidance.

लोकमत

'केआयटी'च्या विद्यार्थ्यांना महावितरणमध्ये प्रशिक्षण

सामंजस्य करार : प्राध्यापकांकडून परीक्षण

लोकमत न्यूज नेटवर्क

कोल्हापूर : येथील केआयटी अभियांत्रिकी महाविद्यालयातील विद्युत अभियांत्रिकी विभाग आणि महावितरण प्रशिक्षण व सुरक्षा केंद्राच्या (एकलहरे- नाशिक) कोल्हापूर-सांगली उपकेंद्रामध्ये बुधवारी सामंजस्य करार झाला. महावितरणतर्फे मुख्य कार्यकारी अभियंता अंकुर कावळे आणि उपकार्यकारी अभियंता रत्नाकर मोहिते, महाविद्यालयातर्फे प्रभारी संचालक डॉ. मनोज मुजूमदार यांनी करारपत्रकावर स्वाक्षरी केल्या.

या कराराच्या निमित्ताने शैक्षणिक संस्था व सरकारी संस्था यांच्यात समन्वयाची संधी निर्माण झाली आहे. विद्युत अभियांत्रिकीचे करार समन्वयक म्हणून प्रा. प्रियांका माने काम पाहणार आहेत. महावितरणातील नवीन प्रकल्प, तांत्रिक आणि सॉफ्टवेअर प्रशिक्षण, विविध योजनांचे महाविद्यालयातील प्राध्यापकांमार्फत त्रयस्थ तांत्रिक परीक्षण आणि इतर महावितरण योजनांमध्ये इंटर्नशिपद्वारे काम करण्याची विद्यार्थ्यांना संधी मिळणार आहे.

या करारासाठी विभागीय महावितरण प्रशिक्षण केंद्राच्या सांगली विभागाचे उपकार्यकारी अभियंता एस. जी. जोशी, आर. एच. पवार यांचे सहकार्य लाभले. या वेळी विद्युत विभागप्रमुख डॉ. विलास बुगडे, प्रा. प्रियांका कुलकर्णी आदी उपस्थित होते. यासाठी केआयटीचे अध्यक्ष सुनील कुलकर्णी, उपाध्यक्ष साजिद हुदली, सचिव दिपक चौगले यांचे मार्गदर्शन लाभले.

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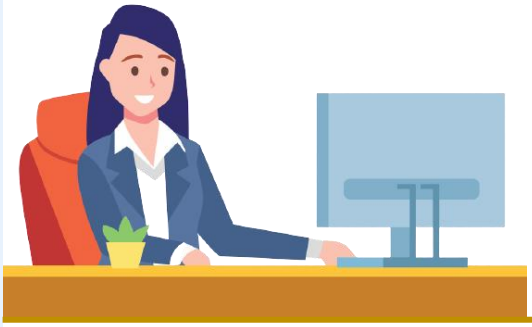
Faculty's Desk

Explained by Experts is a column wherein experts from their respective fields explain their field and the bring out the best information.

In this edition we have Assistant Prof. & Department Academic Co-ordinator Mrs.Sushmita A Sarkar write on how to start preparing for campus placements.



Mrs.Sushmita A Sarkar,

Assistant Professor,

Department Academic Co-ordinator,

Electrical Engineering Department,

KIT's College of Engineering

(Autonomous), Kolhapur

Before we begin, remember this line by Norman Schwarzkopf:

"The more you sweat in peace,the less you bleed in war."

Students enter college with the hope of achieving a good placement, which pays 6 figure salary. Aptitude test is first and most important. The first round demands rigorous study and practice.Before attempting any aptitude analyze the selection process of the company which you are attending.

Whether there is an HR interview or not, or else group discussion is there or not, analyze each and everything which will help you a lot.This is the most important thing, many students attend the interview without revising their subjects. To clear the technical round you must have technical knowledge. Revise foundation engineering subjects to clear technical round.

Be prepared with incidents that are going around, the topic may be anything in a group discussion but you should have some knowledge to answer. And also be confident while you are speaking.This is very important. Each and every company is hiring students who are good at communication. So, improve your communication by practising English communication with your peers, reading books, essay writing, letter writing.

Read daily books for one hour which will improve your communication.While talking to HR don't be dull show some confidence and energy. The company will hire a student who is more active.If you don't get a job or you have been rejected then don't be demotivated. Many opportunities will come in life, just be optimistic and attend the next Campus Placement.

GREEN ENERGY

Muppandal Wind Farm

Kanyakumari, Tamil Nadu

The Muppandal Wind Farm is India's biggest operational wind farm it is a onshore type of windfarm. This project situated in Kanyakumari district, Tamil Nadu. The project was developed by Tamil Nadu Energy Development Agency. Its total installed capacity is 1,500 MW, which makes it the 3rd-largest operational onshore wind farm in the whole world.

Gamesa specialises in sustainable energy technologies, mainly wind power. The 850kW turbines are for medium and high winds to class IA/WZII/WZIII for high wind sites.

The generator's drive train has a main shaft supported by two spherical bearings that transmit the side loads directly to the frame through the bearing housing. This prevents the gearbox from being subjected to extra loads. The generator is a doubly fed machine (DFM) with speed and power controlled through IGBT converters and pulse width modulation (PWM) electronic control. This gives active and reactive power control with low harmonic content and minimal losses.

"The wind farm is helping to reduce India's reliance on fossil fuels, in addition to reducing emissions by an estimated 50,000t CO_2 equivalent a year."

Aerodynamic primary braking is conducted by full-feathering the blades with a hydraulically activated mechanical disc brake for emergencies, mounted on the gearbox high-speed shaft.

Prominent Scientist: **Michel Faraday** (1791 – 1867)

"The secret of my success is comprised of three words –

Work, Finish, Publish"

Michel Faraday (22 September 1791-25 August 1867) was an English scientist who contributed to the study of electromagnetism and electrochemistry . His main discoveries include the principles underlying electromagnetic induction, diamagnetism and electrolysis. It was by his research on the magnetic field around a conductor carrying a direct current that Faraday established the basis for the concept of the electromagnetic field in physics.

Michel Faraday only had most basic school education. Then he began to attend public lessons run by scientists in London. Faraday got job in march 1813 as an assistant of Sir Humphrey Davy. The importance of his work was seen within his own lifetime and the British Government gave him a pension in his old age as a reward.

Aptitude Corner

Q.1] . A person crosses a 600 m long street in 5minutes. What is his speed in km per hour?

A) 3.6

B) 7.2

C) 8.4

D) 10

Q.2] A clock is started at noon. By 10minutes past 5, the hour hand has turned through:

A. 145 degree

B. 150 degree

C. 155 degree

D. 160 degree

Solutions to the Aptitude questions.

A.1] (B) 7.2 km/hr

A.2] (C) 155 degree

Projects by Students

Automatic Power Factor Correction Using Arduino For Industrial Loads.

Group members (T.Y B.Tech):
Shukra Patil, Sunil Pujare, Atharv Sarnaik, Shweta Sawant, Shivtej Surve

In electrical engineering, the power factor of an AC power system is defined as the ratio of the real power absorbed by the load to the apparent power flowing in the circuit, a load with a low power factor draws more current than a load with a high power factor for the same amount of useful power transferred. The higher currents increase the energy lost in the distribution system, and require larger wires and other equipment. Because of the costs of larger equipment and wasted energy, electrical utilities will usually charge a higher cost to industrial customers where there is a low power factor. Power-factor correction increases the power factor of a load, improving efficiency for the distribution system to which it is attached. Linear loads with low power factor (such as induction motors) can be corrected with a passive network of capacitors or inductors.

This is the main purpose of this project where it is to overcome the unwanted problem, power factor need to be improved by installing Automatic Power Factor Compensation using Arduino and capacitor bank. The capacitors can be installed at the service entrance of the plant or on the load side of the metering equipment. This APFC will make the consumers actually see the effect of high and low power system in their consumption of energy

When the power factor of consumer is very low, it will be automatically improved by automatic power factor compensation which use capacitor, Arduino and LCD display as the main components.

The more you explore, the more you grow

Useful Links

Virtual Labs - To provide remote access to simulation based labs in various disciplines of science and engineering.

https://www.vlab.co.in/

Electronics Weekly – A good resource for those looking for industry –related news.
https://interestingengineering.com/

Tutorials Point – the website has a host of educational tools that lead to official certification

https://www.tutorialspoint.com/index.htm

Tech Online- This site contains technical stuff, application notes, reference guides

https://www.techonline.com/

Kolhapur Institute of Technology's College of Engineering (Autonomous),Kolhapur
'A' Grade by NAAC WITH CGPA 3.12

February 2022 Edition

ELECTRO-TALK

E-Newsletter of Department of Electrical Engineering,KITCoEK

Newsletter Committee

Inside this Issue

Interesting facts about Electricity you didn't know!

- Electricity travels at the speed of light, about 300,000 kilometres per second.
- A spark of static electricity can measure up to 3,000 volts.
- The average taser emits 50,000 volts.
- A bolt of lightning can measure up to three million (3,000,000) volts (and lasts less than one second).
- A spark of static electricity can measure up to 3,000 volts.
- Electric eels can produce shocks of 500 volts or more.
- Coal is the world's biggest source of energy for producing electricity.
- Coal is burned in furnaces that boil water. The resulting steam from that boiling water spins turbines that are attached to generators or transformers.
- Fossil fuels are the largest source of electricity, but wind, water and the sun can also produce it.
- The first successful electric car was built in 1891 by American inventor William Morrison.
- Benjamin Franklin didn't discover electricity, but he did prove that lightning is a form of electricity.
- Ever wondered why birds that sit on power lines don't get electrocuted? If a bird sits on only one power line it's safe. If the bird touches any part of its body to another line, it creates a circuit, causing electrocution.
- 54% of all electricity is wasted
- It's the water in the body that causes an electric shock
- Electricity plays a role in your heartbeat
- LED lightbulbs use 80% less electricity
- Some electrics should be tested every 12-24 months
- The five power grids of India, include Northern Region, Eastern Region, Western Region, North-eastern Region, and Southern Region grids

Faculty's Desk

Explained by Experts is a column wherein experts from their respective fields explain their field and the bring out the best information.

In this edition we have Assistant Prof. Mr.Prakash Chavan write Electric power quality,

Mr.Prakash Chavan,

Assistant Professor,

Electrical Engineering Department,

KIT's College of Engineering

(Autonomous), Kolhapur

The term electric power quality is generally used to assess and to maintain the good quality of power at the level of generation, transmission, distribution, and utilization of AC electrical power. Since the pollution of electric power supply systems is much severe at the utilization level, there are a number of reasons for the pollution of the

AC supply systems. A number of customer's equipment also pollute the supply system as they draw non-sinusoidal current and behave as nonlinear loads. Therefore, power quality is quantified in terms of voltage, current, or frequency deviation of the supply system, which may result in failure or mal-operation of customer's equipment.

Typically, some power quality problems related to the voltage at the point of common coupling (PCC) where various loads are connected are the presence of voltage harmonics, surge, spikes, notches, sag/dip, swell, unbalance, fluctuations, glitches, flickers, outages, and so on. These problems are present in the supply system due to various disturbances in the system or due to the presence of various nonlinear loads. However, some power quality problems related to the current drawn from the AC mains are poor power factor, reactive power burden, harmonic currents, unbalanced currents, and an excessive neutral current in polyphase systems due to unbalancing and harmonic currents generated by some nonlinear loads.

These power quality problems cause failure of capacitor banks, increased losses in the distribution system and electric machines, noise, vibrations, overvoltage and excessive current due to resonance, negative sequence currents in generators and motors, especially rotor heating, derating of cables, dielectric breakdown, interference with communication systems, signal interference and relay and breaker malfunctions, false metering, interferences to the motor controllers and digital controllers, and so on.

Faculty's Desk

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The electrical power systems should be designed for the sinusoidal currents and voltages and also for nonlinear and electronically switched loads. There has been an increase in non-linear loads in the recent times, and these can introduce harmonic pollution, distort current and voltage waveforms, create resonances, increase the system losses, and reduce the useful life of the electrical equipment. Harmonics are one of the major problems of ensuring a certain power quality. This requires a careful analysis of sources of harmonic generation and their measurements and the study of the deleterious effects, harmonic controls, and limitation to acceptable levels.

In electric power system, main sources of harmonics may be classified as follows.
Arcing devices
Magnetization nonlinearities of transformers
Rotating machine
Semiconductor based power supply system
Inverter fed A.C. drives
Thyristor controlled reactors
Phase controllers
A.C. regulators

1. Distortion caused by arcing devices:
Arcing devices are very important source of power system harmonics. The voltage versus current characteristics of an electric arc in an arcing device is highly nonlinear. Arc ignition is equivalent to a short circuit current with decrease in voltage. The voltage-current is controlled by the power system impedance.
2.Magnetization nonlinearities of transformers as a source of harmonics
Transformer magnetic material characteristic is nonlinear. This non linearity is the main reason for harmonics during excitation. Sources of harmonics in transformer may be classified into four categories as follows:
Normal excitation: Normal excitation current of a transformer is non-sinusoidal. The distortion is mainly caused by zero sequence triplen harmonics and particularly the third present in the excitation current.
Symmetrical over excitation: When transformers are subjected to a rise in voltage, the cores face a considerable rise in magnetic flux density, which often causes considerable saturation. This saturation with symmetrical magnetizing current generates all the odd harmonics

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Inrush current harmonics: When a transformer is switched off, sometimes there exists a residual flux density in the core. When the transformer is re-energized the flux density can reach peak levels of twice the maximum flux density or more. This causes magnetizing currents to reach up to 5–10 per unit of the rated value, this is known as inrush current. This causes generation of enormous second order harmonic component in the transformer current.

D.C. magnetization: Under magnetic imbalance, the shape of the magnetizing characteristics and the excitation currents are different from those under no load conditions. When the flux is unbalanced, the core contains an average value of flux, which is equivalent to a direct component of excitation current of the transformer. Under such unbalance conditions, the transformer excitation current contains both odd and even harmonic components.

3.Rotating machine as a source of harmonics

Rotating machines also act as source of harmonics in power system. Causes of harmonics generation in rotating electrical machines are classified into following categories:

Nonlinear magnetization characteristics of the core material cause harmonic generation

Non-uniform flux distribution in air-gap is not uniform which leads to harmonics production.

Variation presence in slot and teeth changes the reluctance of the magnetic flux, this variation acts as a reason for harmonic generation. Harmonics produced due to pitch factor and distribution factor.

1. Harmonic generation in synchronous generator depends on the different design factors like pitch factor and distribution factors.
2. Rotor saliency brings the variation of reluctance in the magnetic path and reactance in electric path which contribute to the harmonic generation.
3. crawling & cogging it is a common problem faced by induction motors. During this fault, odd harmonics like 5^{th} & 7^{th} orders appear. It changes the operating characteristics of the motor.
4. Rotor misalignment causes variation of flux linkage in each cycle of rotation contributing to harmonic generation.
5. With the aging, mass unbalance is observed specially in the rotor side. This refers to the core property and adds in harmonic generation.

Bar breakage in an induction motor, either symmetrically or asymmetrically, is reflected in harmonic generation in rotor circuit as well as in stator side.

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2. Power supplies with semiconductor devices:

Semiconductor based power supply systems are the main sources of harmonics. Harmonics generated in power supply include integer harmonics, inter harmonics and sub harmonics. Frequencies and magnitudes of the harmonics depend on the type of semiconductor devices used in the power supplies, operating point, nature of load variation, etc.

3. Inverter fed ac drives:

Application of AC drives has increased to a great extent, most of which are inverter fed AC drives. They use switching circuits using semiconductor devices like GTO, IGBT, etc. Pulse width modulation (PWM) has got very popularity in AC drive application. All these drives are sources of integer as well as fractional harmonics.

4. Thyristor controlled reactors:

VAR compensators used in power system network are also source of harmonics. Different types of thyristor-controlled reactors are used in power system like series controller, shunt controller, static VAR compensator (SVC), fixed capacitor thyristor-controlled reactor (FCTCR), thyristor switched capacitor thyristor-controlled reactor (TSCTCR). All these circuits are sources of harmonics in power system. Use of static synchronous generator (SSG), voltage source STATCOM, current source STATCOM, etc. in power system are increasing rapidly. All these contribute harmonics of both integer and fractional type in power system.

5. Phase controller:

For supply of stable and balanced three phase electric power, phase controller plays important role in power system. Phase controllers used in power system act as source of harmonics. Modulated phase control method is used in cyclo-converter. It performs static power conversion from one frequency to another frequency. Most of the cyclo-converter wave-forms contain frequencies which are not integer multiples of the main output frequency.

6. Ac regulators:

AC regulators used in power system apply both off line and on-line control technique for voltage regulation which result in harmonic generation. On line regulation technique distorts wave-shape more than off line regulation along with other power system disturbances like transients, DC offset, flicker etc.

Effects of harmonics on power system components

Lighting: One noticeable effect on lighting is the phenomenon of "flicker", Lighting is highly sensitive to rms voltage changes; even a slight deviation (of the order of 0.25%) is perceptible to the human eye in some types of lamps. Superimposed

Faculty's Desk

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Generator: Production of pulsating or oscillating torques which involve torsional oscillations of rotor elements of TG set and rotor heating

Motor: Stator and rotor copper losses increase due to harmonic current flow, leakage flux created by harmonic currents causes additional stator and rotor losses, core loss increases due to harmonic voltages and positive sequence harmonics develop shaft torques that aid shaft rotations whereas negative sequence opposes it

Transformer*:* Stray losses increase due to harmonic current flow, hysteresis losses increase, due to presence of high frequency harmonics, resonance may occur between winding inductance and line capacitance.

Relaying: Mal-tripping may occur due to presence of harmonics which affects the time delay characteristics

Switchgear: Due to predominance of skin and proximity effects at higher frequencies, bus-bars behave like cables and transient recovery voltage changes which affect the operation of blow-out coils.

Fuses and circuit breakers: harmonics can cause false or spurious operations and trips, damaging or blowing components for no apparent reason.

Capacitor: Due to presence of harmonics, reactive power increases, dielectric losses increase causing additional heating and resonance and over-voltage may occur, resulting in reduced life.

Cables: Due to increased skin and proximity effects at higher frequencies, additional heating occurs, resistance increases and ac copper loss increases.

Consumer equipment: Life and efficiency reduce drastically

Utility meters: may record measurements incorrectly, resulting in higher billings to consumers.

Communication circuits: Noise creeps in transmitted signals

Conclusion: from above discussion power quality problems solved by mitigation techniques like UPQC, D-STATCOM, UPS, TVSS, isolation transformer, STATCOM, DVR, Surge Protector, STC, SVC etc.

GREEN ENERGY

Koyna Hydroelectric Project

Koyna river, Maharashtra

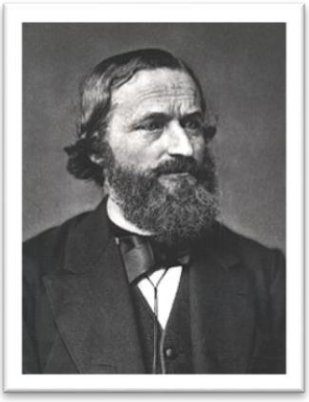
The Koyna Hydroelectric Project is the secondlargest hydroelectric power plant in India, just after Tehri Dam Project.

It is a complex project with four dams including the largest dam on the koyna River, Maharashtra hence the name Koyna Hydroelectric Project. The project site is in Satara district.The Koyana Dam situated near Koyananagar village. On river Koyana.The total capacity of the project is 1,960 MW. The project consists of four stages of power generation. All the generators are,and they are underground powerhouses excavated deep inside the mountains of the Western Ghats. A dam foot powerhouse also contributes to the electricity generation.

Due to the project's electricity generating potential the Koyna River is considered as the life line of Maharashtra. The project takes advantage of the height of Western Ghats. Thus a very large hydraulic head is available over a very short distance. In the early 20th century, there was a survey of the Koyna River as a potential hydro-electric source.

After the First World War, a hydro-electric project on the Koyna river was investigated by the Tata Group. The 1928 financial crisis caused the project to be shelved. After the independence of India, it was taken over by the Government of Maharashtra. In 1951 Koyna Dam division started to look into the project. The project was approved in 1953 and work commenced in early 1954. The second stage of the project was made using a World Bank loan.

Prominent Scientist: **Gustav Kirchhoff** (1791 – 1867)



Gustav Kirchhoff was born on 12 March 1824 in Konigsberg, Prussia, the son of Friedrich Kirchhoff, a lawyer, and Johanna Henriette Wittke. His family were Lutherans in the Evangelical Church of Prussia. He graduated from the Albertus University of Konigsberg in 1847 where he attended the mathematic-physical seminar directed.

He coined the term black-body radiation in 1862. Several different sets of concepts are named "Kirchhoff's laws" after him, concerning such diverse subjects as black-body radiation and spectroscopy, electrical circuits, and thermochemistry. The Bunsen–Kirchhoff Award for spectroscopy is named after him and his colleague, Robert Bunsen.

Aptitude Corner

Q.1] In a box, there are 8 red, 7blue and 6 green balls. One ball is picked up randomly. What is the probability that it is neither red nor green?

A) 1/3

B) 3/4

C) 8/4

D) 3/10

Q.2] What was the day of the week on 28th May 2006?

A. Thursday

B. Sunday

C. Friday

D. Wednesday

Solutions to the Aptitude questions.

A.1] (A) 1/3

A.2] (B) Sunday

Useful Links

Coursera - This website provides free learning and paid courses for student and also encourage to learn something new**.**

https://www.coursera.org/in

All About Circuits -This site is all about circuit there are lots of technical and industrial content ,video lectures and worksheets for students.

https://g.co/kgs/88eRZU

Wolfram Demonstrations Project - Simply choose the subject you are interested in and click on the demonstration of whatever topic you feel unsure about.

https://demonstrations.wolfram.com

Mathwork - If you are interested in research, signal, or image processing then you should learn matlab for sure.

https://in.mathworks.com/?requestedDomain=