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MECHZINE

GET TO KNOW THE WORLD!

R.V.R. & J.C. COLLEGE OF ENGINEERING, GUNTUR, A.P.
KNOWLEDGE IS POWER

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Contents

Contact Information

Mail us at
rvrmechzine@gmail.com

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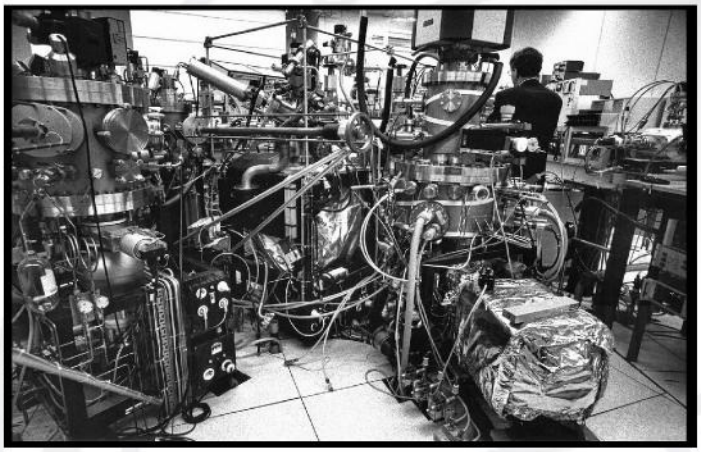
TRANSFORMING MANUFACTURING

-Dileep Kumar Sakkimsetti,
Design Engineer, TCS EIS

Today's industries are undergoing the most fundamental transformation in manufacturing since the introduction of the assembly line more than a century ago. Trends like *Internet of Things, Additive manufacturing (3D-printing)* and *Machine Learning* are merging in the physical and the digital world, resulting in products being smarter. The companies are also changing the way they manufacture and operate their products.

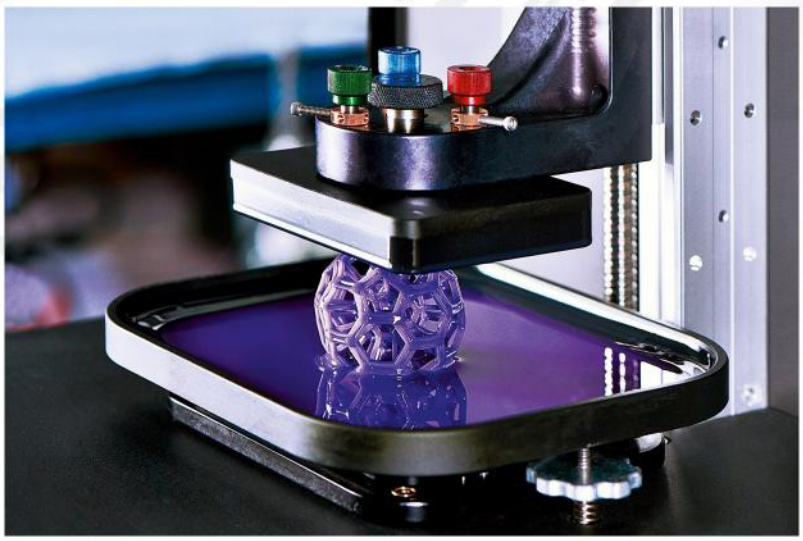


These changes require pervasive engineering simulation, in which simulation performs a central role in all aspects of the product lifecycle from concept, through engineering design and into operation.

Engineers can save time and money by performing simulations earlier in the design cycle, using digital technology to explore a larger design space faster, before making design decisions and locking in costs. Similarly, *simulation* is moving downstream into operations, where real time simulation digital twins is providing insight into a product's real-world performance and maintenance.

The inclination of particular direction of mechanical engineering is not just itself alone. *Mechatronics*, the combination of two engineering main streams, mechanical and electronics, is more and more actively getting involved. This means, the age of conventional machines is almost done. Day by day, we are more relying on automations. Working only on *macroscopic* levels is not the job of mechanical engineering anymore. Since the nanotechnology is getting more and more advanced, mechanical engineers have to deal with microscopic scales to make use of it.

Mechanical Engineers over the next two decades will be called upon to develop technologies that foster a cleaner, healthier, safer and sustainable global environment. According to *ASME*, 2028 vision for mechanical engineers would be needing to collaborate with partners world wide in order to apply innovative solutions and best practices to improve quality of life for all people. *Mechanical Engineers* can be at the forefront for developing new technology of environmental remediation, farming and food production, housing, transportation, safety, security, healthcare and water resources.



Being ingrained in many challenges and innovations across many fields implies Mechanical Engineering is versatile in nature. Hence **get ready for the adventure of making the difficult doable**.

HOW TO BECOME AN EMPLOYABLE ENGINEERING GRADUATE?

Dr. G. Chaitanya
Associate Professor

Looking at the mushrooming growth of engineering colleges in India, how many of these engineering graduates coming out of these colleges are really employable? This question comes to the mind of every one just by observing the standards of students entering these numerous colleges and also the standards of these colleges. The low standard of students entering into these institutes despite having some filtering mechanisms like EAMCET, AIEEE etc., firstly, can be attributed to their school, pre college level education and various socio economic factors etc. Secondly from the institutional perspective, most of these institutions especially private engineering college in particular don't have good infrastructure, faculty possessing adequate qualifications and expertise, placement assistance and R&D facilities.

Now the problem is, on a global front, these so called "ENGINEERING GRADUATES" have to compete against their global peers who have graduated out of esteemed and prestigious institutions like Stanford, MIT, Imperial college of London, etc. Even in India they will find it very hard to compete against their peers coming out of institutions like IITs and other reputed universities. The main reason for this is lack of true awareness about their strengths, weaknesses, total understanding about engineering education and also the reasons for the engineering graduates that make them employable. The solution to this problem begins with self-awareness. The students should identify at their pre-college level, whether they are truly passionate about Engineering or not. At that age, most of the students will be in a confused state on what course they have to select or which field they need to choose. They will most likely choose the field which most of their peers have chosen irrespective of their interest if not guided properly. At this juncture, it is the responsibility of their parents, teachers, guardians or well-wishers to guide them in a right manner. Now after choosing the right course, the next most important thing is to choose the right institution for that course of study. The selection of the institution must be based on its track record of the institution in terms of placements for that course, faculty experience and expertise, institutional facilities such as pre-placement training, library facility, laboratories and R& D facilities for that course. After selecting appropriate institution and branch of study, the students should focus upon improving their conceptual knowledge as well as practical skills on various subjects of their study by totally utilizing the facilities available. At the same time, they must be aware of day to day advancements happening around the world in their chosen field of study. This can be

institutional facilities such as pre-placement training, library facility, laboratories and R& D facilities for that course. After selecting appropriate institution and branch of study, the students should focus upon improving their conceptual knowledge as well as practical skills on various subjects of their study by totally utilizing the facilities available. At the same time, they must be aware of day to day advancements happening around the world in their chosen field of study. This can be accomplished to some extent by following latest journals, online information, news articles, attending and participating in student seminars, attending international conferences…etc. Acquiring skills in certain software pertaining to their field of study can become an added advantage. Attending Pre-placement talks, Campus recruitment training classes will help students assess their strengths and weaknesses both on subject front as well as communication front. One of the most important aspects that needs due attention is building a salable resume or Curriculum vitae. For any face to face interview (or) getting short listed for a written test, a resume acts as a communicator between the employer and employee. A resume for a fresher ideally should reflect his/her objective or vision about how he or she would like contribute if chosen, from the organization's point of view. Most of what is presented in the resume must be tangible, reliable and apt. A strong resume is a reflection of strong written communication skill displayed by the candidate. Therefore, students should also focus upon improving their written communication skills apart from improving their verbal communication skills. If needed, students can approach some online resume builders to improve their C.V. The above mentioned aspects if followed would definitely improve the credibility of engineering graduates.

Recent Advances of CFD in Cardiovascular Diseases

Courtesy: NCBI

Introduction:

Computational fluid dynamics (CFD) is a mechanical engineering field for analyzing fluid flow, heat transfer, and associated phenomena, using computer-based simulation. The merit of CFD is developing new and improved devised systems, also optimization is conducted on existing equipment through computational simulations, resulting in enhanced efficiency and lower operating costs. The main reason why CFD in the biomedical field has lagged biomedical field has lagged behind is the tremendous complexity of human body fluid behavior.

Due to recent advancements in hardware and software's CFD biomedical research is more accessible. All CFD processes contain three main components to provide useful information, such as pre-processing, solving mathematical equations, and post-processing. Initial accurate geometric modeling and boundary conditions are essential to achieve adequate results. Many simulations and clinical results have been used to study congenital heart disease, heart failure, ventricle function, aortic disease, and carotid and intra-cranial cerebrovascular diseases.

Applications in Cardiovascular System:

Recently, medical researchers have used simulation tools to assist in predicting the behavior of circulatory blood flow inside the human body.Computational simulations provide invaluable information that is

that is extremely difficult to obtain experimentally and is one of the many CFD sample applications in the biomedical area in which blood flow through an abnormal artery can be predicted. CFD analysis is increasingly performed to study fluid phenomena inside the human vascular system. Medical simulations of circulatory function offer many benefits. They can lower the chances of postoperative complications, assist in developing better surgical procedures, and deliver a good understanding of biological processes, as well as more efficient and less destructive medical equipment such as blood pumps. Furthermore, medical applications using CFD have expanded not only into the diseased clinical situation, but also into health life supportives, such as sport medicine and rehabilitation.

Final Remarks:

Efficient creative models for simulating complex fluid mechanics problems in the human body and therapeutic models are now being progressively applied, particularly with the availability of commercial CFD computer programs. However, a realistic multidisciplinary approach is essential to accomplish these tasks. Indefinite collaborations between mechanical engineers and clinical and medical scientists are essential. CFD may be an important methodology for understanding the patho-physiology of developing and progressing cardiovascular disease and for establishing creative treatment modalities in the cardiovascular field.

Supply Chain Management: A look back, A look Ahead

Courtesy: James R. Stock, Ph.D

Most logistics and supply chain management practitioners would agree that change is inevitable, and certain. What we can do, however, is examine some of the major events of the past, learn from them, and then uses them to guide us in forecasting and shaping the future.

The historical perspective

In 1963, the National Council of Physical Distribution Management (NCPDM) was formed by a group of forward thinkers from industry and academia. It was the first time that physical distribution practitioners could assemble in a formal way to discuss strategies and tactics related to their profession. Always oriented toward education and research, the organization changed its name and focus in 1985 to the Council of Logistics Management (CLM) and in 2005, the organization changed its name and focus again, to CSCMP, reflecting the fact that logistics had become part of a broader process called 'supply chain management'. To this day, the organization continues to be the premier source for leading-edge education, research, and practices in the areas of logistics and supply chain management.

Additionally, the rising importance of issues such as sustainability, reverse logistics, product stewardship, and energy conservation have placed additional burdens on the supply chain because of its significant consumption of natural resources and its potential for impacting the environment. Political intervention via new laws and restrictions will most likely keep these issues at the forefront of public policy issues affecting supply chain operations.

A bright but challenging future

The combination of these and many other events and developments has brought supply chain management to where it is today, and it will be the basis for what SCM will become in the future. As logistics and supply chain professionals prepare for the future, they will face a number of challenges and issues. Most notably, they will have to deal with continuous upgrades in technology; the growing importance of "big data" and data analytics in SCM; increasingly widespread uncertainty and the associated need for a greater focus on risk management; growing government involvement in business (in regard to taxes, inflation, debt, and infrastructure, for example); and labor shortages at all levels.

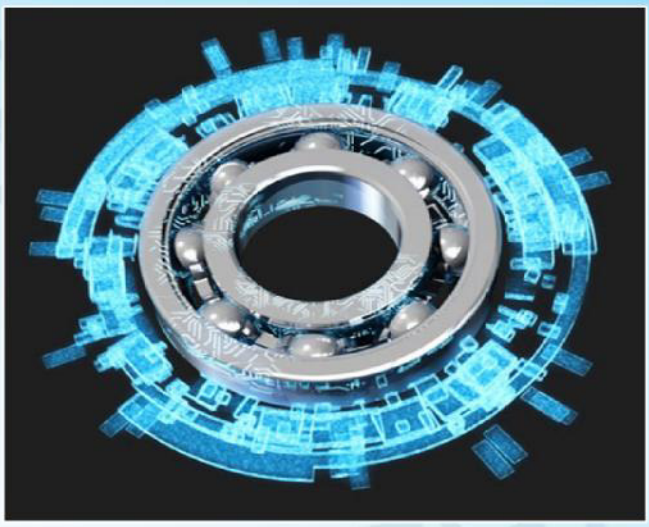
In other words, supply chain professionals will have to face "the good, the bad, and the ugly" in the future. The "good" is that SCM can provide significant benefits to organizations and their customers, and a large number of employees will have to be hired to fill all types of supply chain positions. The "bad" is that it will be more difficult to plan, implement, and control supply chain operations because of various risk and uncertainty factors, such as labor shortages, increasing government involvement in business, and other uncertainties in the global marketplace.

The "ugly" is that, while everyone knows that efficient and effective supply chains are vital to the growth and development of economies, industries, and organizations, it will not be easy to achieve that. Technology will be available to assist, but people will have to know how to most effectively use that technology. And yes, there will be data available to provide supply chain decision-makers with the information they need to make the best decisions. However, the tidal wave of data that will be available will tax the managerial capabilities of most supply chain professionals.

Smart Bearing Technology

Courtesy: Bearing Specialist Association

Proper bearing analysis is the key to keep equipment running efficiently, reliably, consistently and cost-effectively. Monitoring and preventing bearing damage can enhance productivity, ensure high performance and ultimately affect the bottom line. Use of "smart" bearing technology is one of the methods where manufacturers monitor bearing operation. Smart bearings are instrumented with sensors to provide information about their surrounding environment, including speed, direction, temperature, vibration, load, level of debris and other factors. The integration of sensors and bearings gives smart bearings their name.



Once smart bearings gather the data, they feed it to a control unit that is used to monitor particular bearing operation. For example, smart bearings used in automotive wheel applications collect data used to operate anti-lock brakes. Further, in industrial applications, the data collected by smart bearings is often matched with condition monitoring programs, where being aware of temperature and vibration levels is essential to prevent bearing failures. Smart bearing technology is used in a variety of industries like automotive, industrial, etc. Specific applications include automotive wheel speed and direction feedback, machine control, robotic control, printing industries, paper converting, wood processing, chemical production, textile, agriculture machinery and food processing.

Smart Bearing Types

The most popular smart bearings are found in automotive wheel applications. Mostly, automotive hub unit bearings commonly include speed sensors which send wheel speed data to ABS (anti-lock brake system) and traction control unit of light vehicles. In the industrial market, housed bearing units can be equipped with sensors that monitor bearing speed, vibration, temperature or a combination of all three. The speed pickup proximity switch senses the presence of two targets on a special collar or locknut inside the sensorized bearing housing. When a target comes into range, the proximity switch closes, allowing the supplied voltage to pass through. The time between the two pulses per revolution may be measured to determine the shaft speed.

Available Sensors

The types of sensors that create smart bearings also range in capabilities and usage. Sensors are available to measure speed, direction, temperature (thermocouple) and vibration (accelerometer).

Conditions Monitoring:

Manufacturers continue to further explore the benefits of smart bearings in specific applications. Currently, smart bearings are evolving to have the ability to measure bearing system performance and predict the remaining useful life. Condition monitoring units are yet another option in predictive bearing maintenance technology and can be used in conjunction with smart bearing sensors. Just as sensors being used to transmit data to a source, condition monitoring units are external devices that can receive data on the operating conditions of equipment. Together, these devices can communicate to an operator when critical machine elements have become worn, contaminated, damaged, improperly lubricated, experience a rise in temperature or vibration. Smart bearings can send the performance data via wireless or wired arrangements. As industries continue to grow and develop, additional smart bearing sensor data is needed to more closely monitor the bearing function. Advancements in bearing technology, including data sharing and maintenance will continue to be on research for more applications.

SPEND SOME TIME

TIME. There are many ways to keep track of it and many devices too. One among such is a Torsional Pendulum Clock. What is so special about it? Is it not any general clock that tracks the time? Well, it is and it isn't. Let us go back to the time when there were no digital watches (clocks), a time so old that the invention and manufacture of clocks was at its prime, a time when everything was bound to the mechanical moments of gears, links and springs and a human intervention was absolute for any device to work.

One had small clocks which had to wind the spring of the clock every day or for every mid-day, to make it work properly and continuously. It eventually became a habit to them, for they had to do it each day, every day as long as that clock lasts. The day would start with winding the clock and the day would end by winding it again. Or one had the luxury of buying a long pendulum clock which would be fixed to a wall.

Then came Torsional Pendulum Clock, invented by Robert Leslie into being. A clock that would run for a straight 400 days continuously, with one single winding of the spring. Hence it got the names 400-Day or Anniversary Clock.

Here is a detailed explanation on how it works and its construction:

A Torsion Pendulum Clock is a mechanical clock which keeps the track of time by the mechanism of torsion pendulum. This is usually a weighted disk or a wheel with chrome balls on spokes, suspended by a thin wire called as torsion spring. And the torsion pendulum rotates about the vertical axis of the wire, twisting it, instead of swinging like an ordinary pendulum. The clock's gears apply a pulse of torque to the top of the torsion spring with each rotation to keep the wheel going. The wheel and torsion springfunction as a harmonic oscillator to control the rate of the clock's hands.

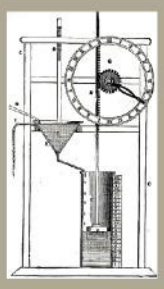
The rate of the clock can be made faster or slower by an adjustment screw mechanism on the torsion pendulum that moves the weight balls. The closer in the balls are, the faster it will turn causing the clock to speed up. One oscillation of the torsion pendulum usually takes 12 to 20 seconds

The escapement mechanism, that changes the rotational motion of the clock's gears to pulses, works rather like an anchor escapement. As the anchor releases a tooth of the escape wheel, the lever, which is fixed to the anchor, moves to one side and, via the crutch, gives a small twist to the top of the torsion spring which is enough to keep the oscillation going.

EVOLUTION OF CLOCKS

SUN DAIL

WATER CLOCK



CANDLE CLOCK

HOUR GLASS

PENDULUM CLOCK

GEAR CLOCK

Dark matter: the matter that we cannot see

Raj Akhil
Y14ME966

All that our eyes capture is actually the reflection of light from a specific body. If light doesn't happen to fall on a particular object, we obviously can't see that. We call this phenomenon as dark. Here arises a question, does the light fall on everything? Do all bodies and the matter in the universe reflect light? Everywhere light doesn't get reflected is dark. All this contributes to the existence of dark matter. Coming to the initial stages of the composition of matter, everything is made of atoms. Now, let us consider the Saturn. The rings around the planet are in a specific shape. But we can also see spaces in between the rings in a close-up. There should be some force or energy which fills the spaces and also maintain them together. It is said that there exists some matter for the togetherness of the shape which is not a visible thing. This existing matter is the dark matter. We do not know the composition of the dark matter whether it absorbs light with 100% efficiency or not. The further evidence for the existence of the dark matter is that the accelerating expansion of the universe. This acceleration is similar to the acceleration of a car. The acceleration is to be given either by some energy or the laws of the gravitational force. There is some kind of energy that

pushes the universe and this is called dark energy. Statistics say that there exists 68% of dark energy, 27% of the dark matter and the remaining 5% as the visible matter. Exploring the universe reveals its complete form.

BHARATHA "RATHNA"

Satish Dhawan

He was born on September 25, 1920 at Srinagar in J&K. His educational qualifications include B.A., M.A.(Engg. Lit.); B.E. (Mech. Engg); M.S. (Aero Engg.); Ae.E.; Ph.D., California Institute of Technology in 1951 and D.Sc. Professor Dhawan is associated with the research and development of aeronautics in India. He has written many research papers on Shockwave-Boundary Layer interactions, transonic and supersonic wind tunnels, transition phenomenon and turbulence.
Professor Dhawan received the Padma Shri in 1966, Alumni Distinguished Service Award from California Institute of Technology in 1969, Padma Vibhushan in 1981 and Indira Gandhi Award for National Integration in 1999.

World's First Helicopter

On September 14, 1939, the VS-300, the world's first practical helicopter, took flight at Stratford, Connecticut. Designed by Igor Sikorsky and built by the Vought-Sikorsky Aircraft Division of the United Aircraft Corporation, the helicopter was this first to incorporate a single main rotor and tail rotor design. Piloted by Sikorsky, the September 14 tethered flight lasted just a few seconds.The innovative 28-foot diameter, three-blade rotor allowed for variable pitch of the blades with a blade speed of 250 to 300 mph. The concepts demonstrated in the VS-300 provided the basis for the first production helicopters and became the standard for helicopter manufacturing across the world. The patent was granted on March 19, 1935. Presented to Henry Ford and included in his Edison Museum in Dearborn, Michigan, on October 7, 1943, the VS-300 today remains on display at the Henry Ford Museum.

WATCH OUT FOR FALLING BULLETS

Sandeep
Y14ME963

Shooting bullets into the sky is to signal an occasion or the common practice of firing 21-gun salutes at military funerals. It is said that bullets fired at an upward angle of 45^0 or less can be far more lethal than at 90^0, since they're likely to hit someone on the ground while travelling at a much greater speed. Why has this question confounded so many experimenters over the years?

Because it's impossible to calculate the exact minimum velocity required for a bullet to perforate the skin. From hundreds of years of shooting at pigs, oxen, and other objects, munitions experts estimate that a bullet must be travelling at least 136 mph in order to break through the skin. Skin thickness varies significantly from person to person, and in different places on the same individual. Experiments conducted with real falling bullets have confirmed that this is enough to cause significant injury. The general consensus is that a bullet fired straight up, at precisely 90^0 to the horizontal is unlikely to kill a healthy adult when it returns to Earth. That is because, on the way down, air resistance prevents the bullet from returning to its initial velocity.

FAILURES IN ALLOY WHEELS

D. Manoj kumar, Y15MTMD803
M.Tech. Machine Design

It is the science of predicting the conditions under which solid materials fail under the action of external loads (WHAT IS?). Failure detection is also one of the important processes. The failure of a material is usually classified into brittle failure (fracture) or ductile failure (yield). It can be easily detected by various non destructive methods such as visual inspection, ultrasonic inspection etc. Failure criteria's are the functions in stress or strain space which separate "failed" states from "un failed" states.

MAJOR CAUSES OF FAILURE

- Over tightening of the bolts and Fastener failure
- Corrosion
- Improper material
- Manufacturing defects

PICTURES SHOWS GENERAL WHEEL RIM

FAILURES AND REMEDIES

CORROSION

This is one of the major failures in alloy wheels. Corrosion is the deterioration of a metal as a result of chemical reactions between it and the surrounding environment. Both the type of metal and the environmental conditions, determine the form and rate of deterioration.

All metals corrode. Some, like pure iron, corrode quickly. Stainless steel, however, which combines iron and other alloys, has slower rate of corrosion and is therefore used more frequently.

All small group of metals, called the Noble Metals, are much less reactive than others. As a result, they corrode rarely. They are, in fact, the only metals that can be found in nature in their pure form. The Noble Metals, not surprisingly, are often very valuable. They include copper, palladium, silver, platinum, and gold.

If the wheel fasteners are under-tightened, they will eventually loosen, resulting in wheel damage or separation from the vehicle. If the fasteners are tightened beyond their design limit, the wheel stud or bolt can permanently stretch or even break during installation.Never use an impact gun to tighten custom wheel fasteners. Not only will it be able to accurately control the level of fastener tightness, but use of an impact tool can easily damage the fasteners or the adjacent wheel surface(MEANING LESS SHIT).

MANFACTURING DEFECTS

Surface defects are discontinuities that occur on the surface. Surface defects in aluminium die castings can result from deficiencies at any stage of the manufacturing process. The prevention of surface defects is a key requirement when producing most aluminium die castings.

The prevention of defects related to the casting process can best be achieved through proper design of the die and feed system and control of the variables associated with the die casting process

PICTURES SHOWS WHEEL RIM WITH DEFECTS

IMPROPER MATERIAL

A rim is a necessary part of every automobile wheel. Depending on the material used in wheel rim production, there are several most common rim types available in the contemporary automobile market.

Steel wheel rim. It is a standard type of a rim. Due to its properties, steel is one of the most important engineering and construction material(NO ESSENCE). Steel has great formability, impermeability and durability. Its notch-toughness makes it possible to resist cracks that may lead to sudden collapse of a product structure. Steel is a cost-effective material as it is less exotic and its manufacturing process is not complicated. This type of wheels are usually easy to repair. Compared to other materials, one of the main disadvantages of steel is its heavy weight.

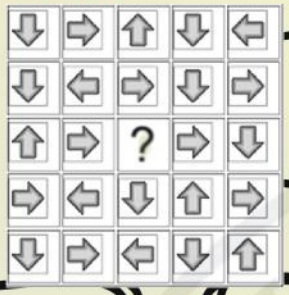
This automobile part is manufactured from an alloy of magnesium or aluminium(WHICH AUTOMOBILE PART??). One of the main benefits is the lightweight that results in better handling and reduction of in sprung weight. When installed on a vehicle, alloy wheels reduce the overall weight that in turn lead to fuel saving. Compared to steel wheels, alloy rims provide better heat conduction. This improves braking performance as the heat is dissipated from the vehicle's brakes. It also reduces a possibility of overheating.

The disadvantage of the alloy rims includes inability to withstand corrosion. It is necessary to apply a paint layer or another coating to prevent rust formation. Elevated costs is another disadvantage. Alloy wheels are also difficult to repair. Unlike steel wheels that are mostly popular among devotees of vintage appearance, alloy rims are commonly used as they are available in dozens of styles and may add stylish accent to vehicle exterior.

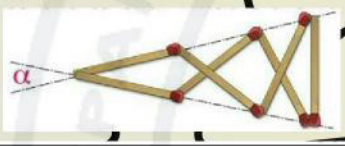
FUN ZONE

PUZZLE TIME

1. What is the direction of arrow at '?'



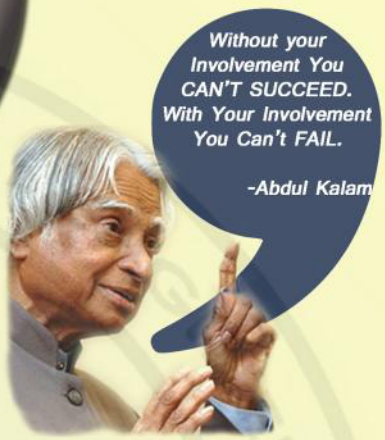
2. A triangle is formed with 7 matchsticks of equal length connected end to end. What is the value of α ?



MATH TRICK

An easy trick to find squares of numbers from 51 to 59

51x51=2601
52x52=2704
53x53=2809
54x54=2916
55x55=3025
56x56=3136
57x57=3249
58x58=3364
59x59=3481



TRENDING APPS

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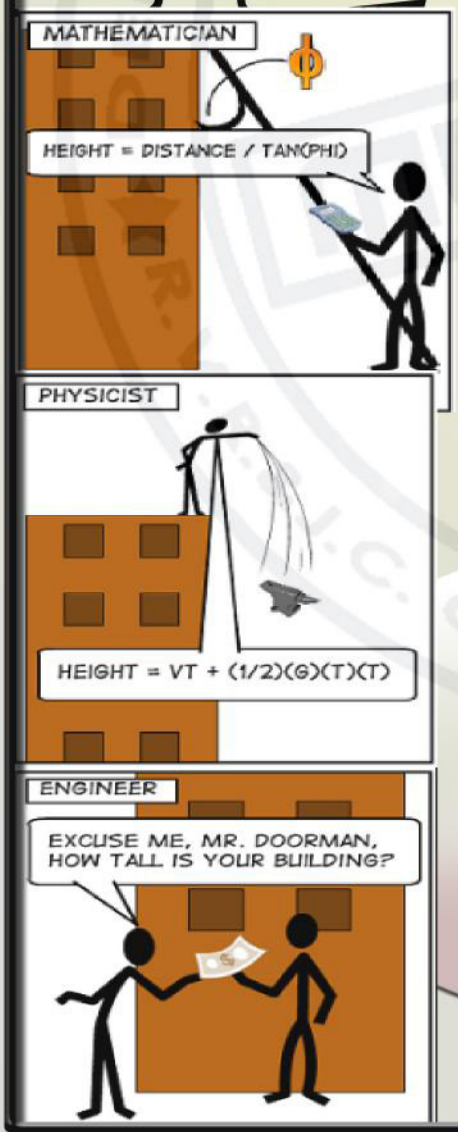
Practice daily - new daily tests on all topics, based on last year papers.



Look at the chart and say the COLOUR not the word.

YELLOW BLUE ORANGE
BLACK RED GREEN
PURPLE YELLOW RED
ORANGE GREEN BLACK
BLUE RED PURPLE
GREEN BLUE ORANGE

Left - Right Conflict
Your right brain tries to say the colour but your left brain insists on reading the word

Puzzle Time Answers:
1) ⇧
2) 25.71°

DEPARTMENT OF MECHANICAL ENGINEERING
R. V. R. & J. C.
COLLEGE OF ENGINEERING
(AUTONOMOUS)
CHANDRAMOULIPURAM
CHOWDAWARAM, GUNTUR