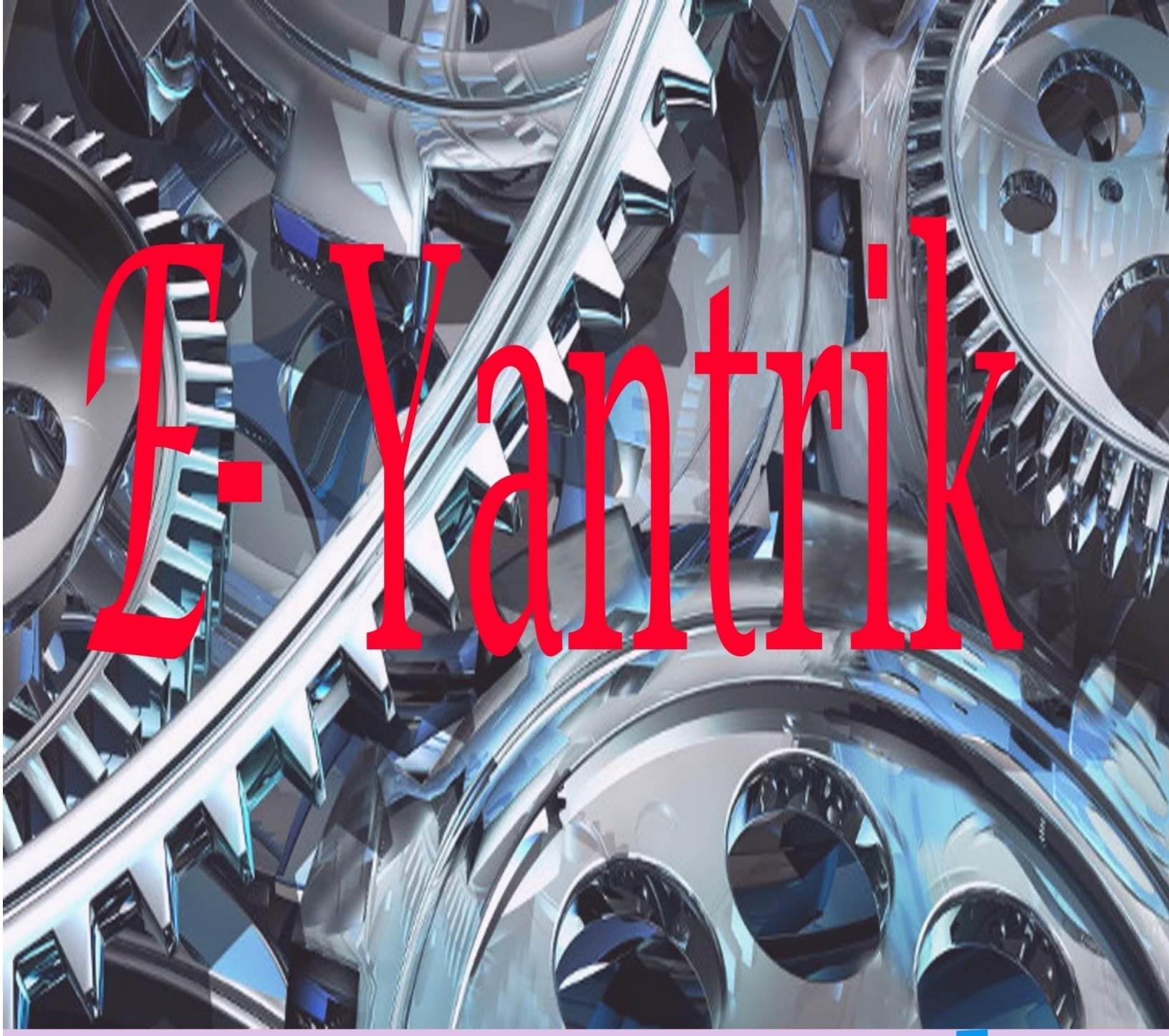


E-Yantrik

Volume: 8

1st :Issue

GIFT

Student Editors: **Rakesh Chandra Biswal**

Chitaranjan Kumar

Faculty Editor: **Dr. Alok Mohapatra**

Vision of the Department:

To become a centre of excellence, acclaimed globally as a source of knowledge in the field of Mechanical Engineering by producing the professionals of highest grade to excel in the field of Industry and Research, bearing the ability to face the challenges posed by latest technology and competition.

Mission of the Department:

- To impart quality education to the students and enhance their knowledge and skills to make them globally competitive Mechanical Engineers.
- To become a leader in the field of Mechanical Engineering by acquiring and disseminating knowledge, using the best methods of teaching.
- To develop linkages with Industrial and Research organizations, enterprises in India for industry-oriented projects to apply theoretical knowledge to practical problems.
- To develop entrepreneurship skill of the students to make them ready for self-employment.

PEO's of the Department

Program educational objectives of Undergraduate Mechanical Engineering Department are

- PEO-1 : Our graduates will succeed as a mechanical engineer or obtain an advance degree by applying basic principles of engineering and skills to solve complex engineering problems.
- PEO-2 : Our students will be able to carry out Multidisciplinary research using modern tools and adapt to current changes by inculcating habit of lifelong learning.
- PEO-3 : Our Students will be able to work in the field of clean energy for the welfare of the society as responsible citizens with good ethics.

From the HOD'S Pen

Dear Readers,

Greetings from Department of Mechanical Engineering!

I am pleased to know that our students are successful in bringing their first issue of magazine E-YANTRIK for this academic year 2017-18. E-YANRIK, the departmental magazine has the prime objective of providing aspiring engineers a wide platform to showcase their technical knowledge and to pen down innovative ideas. This magazine is intended to bring out the hidden literary talents in the students and teachers to inculcate strong technical skills among them. As a half yearly magazine of GIFT, it helps the students to interact and share their ideas with the industry leaders and their peers studying in the college.I congratulate and thank all the students and faculty coordinator who have made untiring efforts to bring out this magazine.

I thank everyone for their valuable contributions to the magazine and hope to receive similar enthusiasm through your precious insight in the fourth coming issues of E-YANTRIK.

Thanks & Regards,

Prof. Alok kumar Mohapatra

H. O. D, Mechanical

Gandhi Institute For

Technology, Bhubaneswar

From the Editor's Pen

Dear Readers,

Greetings from Department of Mechanical &Engineering!

I am delighted to learn that our college is bringing out a magazine for this academic year. It is a nice platform for both the faculty and the students to exhibit their talents. I strongly believe that it would be an excellent medium through which the world can learn about the potential and achievements . I hope that this would be an ongoing process and the magazine would bring out the latent talent of everyone. I join others in appreciating and recognizing the hard work of the magazine committee in bringing out the magazine and in wishing them success in their endeavour.

Thanks & Regards,

Dr. Alok Mohaptra

Dept. of Mechanical

Editor, E-Yantrik

- **Article**

1. **ASIMO ROBOT**
2. *A study on implementation of simulation at Operational level in manufacturing system*
3. *A novel discount mechanism for bu Online pick up in store (bops)*
4. *Makespan optimization in open shop scheduling*
5. *Assessment of manufacturing process through Lean manufacturing and sustainability Indicators: case studies in indian perspective*

- **Some Intresting Facts**
- **Technical quiz**
- **Mechanical Poem**
- **Grate Quotes**

NANO SCIENCE IN EVERYDAY LIFE

Prof. Rajeswari Chaini

Heat transfer is a phenomenon that plays a major role in the world of thermodynamics. In automobiles, heat transfer from the engine is a very vital phenomenon. There is the challenge of removing excess of heat with the help the fins from the engine to increase engine's efficiency. This paper attempts to properly design and optimize a fin using Finite volume analysis to increase heat transfer rate. The most common type of mode of heat transfer in fluids is convection. Convection takes place due to the movement of molecules. When the movement of these molecules takes place without any external source, it is called natural convection.

And when it happens with the aid of external source, it is called forced convection. When both these mechanisms act together to transfer heat i.e., when there is an interaction between buoyant and pressure forces, it is called mixed convection. To achieve mixed convection, a lid driven cavity is used where natural convection is obtained by maintaining the temperatures of walls of the cavity at different temperatures and forced convection is obtained with the help of the top wall of the cavity which moves with a certain velocity. In case of constant wall temperature (CWT), the surface wall has the same temperature throughout, but the flow of heat per unit area through the walls is different. And in case of constant heat flux (CHF), the wall temperature may not be uniform throughout but the rate of flow of heat per unit area through the wall surface remains same. Grashof's number is the ratio of buoyancy to viscous forces acting on the fluid. With the help of Grashof's number, one can predict if natural convection or forced convection is dominant. Prandtl number is the ratio of momentum diffusivity to thermal diffusivity. It can be used to determine the thermal conductivity of gases at high temperature. It also provides information about thermal and hydrodynamic boundary layer. Reynold's number is the ratio of inertial forces to viscous forces in a fluid flow. It helps us to predict the patterns in fluid's behavior. For Gr = 0, it becomes purely forced convection and for Gr = 105, natural convection is predominant It has been observed that, when flow advances towards purely natural or purely forced convection, heat transfer rate increases. Also, an obstacle in the cavity helps in offering resistance to flow which increases heat transfer.

A square cavity of side 1 m in length containing fluid with top wall moving is considered for the numerical analysis. The length of the lid is considered as the reference length. Since in this study the non-

dimensional analysis was carried out from an application point of view, the driving velocity of lid is not specified. the fluid moves along the direction of top plate since Reynolds number is very low, because of which the convective zone stays above the blockage. But once the Reynolds number increases the convective zone moves to the right a little and then starts moving towards the blockage. With increase in Reynolds number the convection changes from natural to forced convection. But for triangular blockage we can observe more forced convection than in that of other two blockages. With increase in Reynolds number the fluid circulates properly around the blockage taking away more heat. With increase in Prandtl number the heat capacity of water increases and because of which convection occurs at a faster rate. The difference between the square and triangular blockage is only with the presence of inclined edge for the triangular the blockage. Sharper the edge more is the convection rate because the fluid interacts with the surface for a considerable time as it comes to rest at that edge and it enhances heat transfer

ASIMO ROBOT

Mr. Uttam Kumar Das,, 3rd year Mechanical

Robots, the suppositious concept that has been demonstrated a million times in movies, comes to life with the brilliant exertion of Honda. ASIMO or Advanced Step in Innovative Mobility is a state-of-the-art humanoid robot created by Honda in the year 2000. Aimed to be a multi-functional portable assistant, ASIMO is intended to function in re-al-world environments. The creation of ASIMO was envisioned to help people who are bed ridden or disabled. ASIMO beats humans in tasks which can be devastatingly dangerous for them for instance, going in hazardous areas, scrapping fires or de-fusing a bomb. The composition of ASIMO hasbeen kept purely welcome and friendly.The era of robots existence has been a topic of continuous debates and has invited numerous advantages and disadvantages of the actuality of robots but,Honda with its very first creation has prove robot scan operate efficiency Height: The brainy master piece stands tall with the height of 4 ft. 3 in. and weighs around 48 kg further making it a welcoming robot. The average height of ASIMO brands it a participant of comfortable conversations with the elderly and people with less mobility. Its companionable height makes it a perfect size for assisting household tasks and people confined to bed or wheel chairs.

Skills: ASIMO was tossed with a purpose of aiding the needs of the elderly and disabled as well as managehousehold errands. ASIMO has human like features as it can make gestures, speak and inter-act like humans which makes it a friendlier robot. ASIMO holds the capability to sense the movements of numerous objects while capturing visual information by it's camera eyes. Determination of direction and distance is also done by the two camera eyesofASIMO.Theformer features of ASIMObles human like feature. average speed of around 9kilometers per hour. The movements of ASIMO are managed by aimed Zero Moment Point control as well as floor reaction conrol that allows ASIMO to stay firm at a particular position and maintain it healthily. The body position,length of steps and speed are adjustable by ASIMO. ASIMO's hands, legs, waist and neck have variable degrees of movement. The degree of freedom is de-fined specifically of each robot and to frame further, ASIMO has 57 degree of freedom. The fundamental body parts of ASIMO like wrist, shoulder, hip joints and neck individually has around three degrees of freedom whereas, hands with one thumb and four fingers have two degrees of freedom.

For determination of obstacles, ASIMO has visual sensors. In totality, ASIMO has sensors which helps it in autonomous navigation. The lower portion of ASIMO has one infrared sensor and one laser sensor. The infrared sensors help ASIMO determine the floor patterns to confirm the navigational path of strategic map while the laser sensor aids ASIMO to sense ground surface.

SMART MATERIALS

Mr. Soumya ranjan sahoo, 3rd Year mechanical

INTRODUCTION:

Materials that can change one or more of its properties in response to an external stimulus are called smart materials.

For example, the shape of the material will change in response to different temperature or application of electrical charge or presence of magnetic field.

HISTORY:

Most of smart materials have been discovered around 55 years ago, but they were not exploited to get the benefits which they possess.

TYPES OF SMART MATERIALS

- PIEZOELECTRIC MATERIALS
- SHAPE MEMORY ALLOY
- MAGNETOSTRICTIVE MATERIALS
- pH-SENSITIVE POLYMERS
- HALOCHROMIC MATERIALS
- PHOTO MECHANICAL MATERIALS
- SELF-HEALING MATERIALS

PIEZOELECTRIC MATERIALS

Piezoelectric materials are materials that produce an electric current when they are placed under mechanical stress. The piezoelectric process is also reversible, so if you apply an electric current to these materials, they will actually change shape slightly (a maximum of 4%).

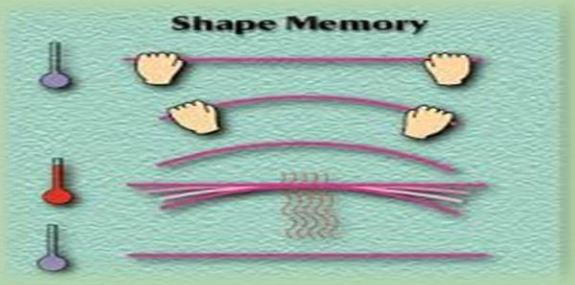
Example: Quartz; Aluminum Nitride; Barium Titanate; Gallium Phosphate; Lead

There are several materials that we have known for some time that posses' piezoelectric properties, including bone, proteins, crystals (e.g. quartz) and ceramics (e.g. lead zirconate titanate).

Piezoelectricity is an exciting field of Nanotechnology, and there are already tests being run outside labs to try and harness this form of power. In many places including Japan's subway, dance floors across the world and football stadiums, engineers have already put in place piezoelectric floors that use the high volume of footfall to decrease their demand for electricity from the grid. With a bit of luck in the years to come, piezoelectricity will become another weapon which we can use to reduce our reliance on fossil fuels and to derive the energy we need.

SHAPE MEMORY ALLOY

A shape-memory alloy is an alloy that can be deformed when cold but returns to its pre-deformed ("remembered") shape when heated. It may also be called memory metal, memory alloy, smart metal, smart alloy, or muscle wire



The two most prevalent shape-memory alloys are copper-aluminium-nickel and nickel-titanium (NiTi), but SMAs can also be created by alloying zinc, copper, gold and iron. Although iron-based and copper-based SMAs, such as Fe-Mn-Si, Cu-Zn-Al and Cu-Al-Ni, are commercially available and cheaper than NiTi, NiTi-based SMAs are preferable for most applications due to their stability and practicability and superior thermo-mechanic performance. SMAs can exist in two different phases, with three different crystal structures (i.e. twinned martensite, detwinned martensite and austenite) and six possible transformations.

Shape-memory alloys have different shape-memory effects. Two common effects are one-way and two-way shape memory. A schematic of the effects is shown below.

The procedures are very similar: starting from martensite (a), adding a reversible deformation for the one-way effect or severe deformation with an irreversible amount for the two-way (b), heating the sample (c) and cooling it again (d)One-way memory effect When a shape-memory alloy is in its cold state (below As), the metal can be bent or stretched and will hold those shapes until heated above the transition temperature. Upon heating, the shape changes to its original. When the metal cools again, it will retain the shape, until deformed again.

With the one-way effect, cooling from high temperatures does not cause a macroscopic shape change. A deformation is necessary to create the low-temperature shape. On heating, transformation starts at As and is completed at Af (typically 2 to 20 °C or hotter, depending on the alloy or the loading conditions). As is determined by the alloy type and composition and can vary between −150 °C and 200 °C.

Two-way memory effect The two-way shape-memory effect is the effect that the material remembers two different shapes: one at low temperatures, and one at the high-temperature shape. A material that shows a shape-memory effect during both heating and cooling is said to have two-way shape memory.

This can also be obtained without the application of an external force (intrinsic two-way effect). The reason the material behaves so differently in these situations lies in training. Training implies that a shape memory can "learn" to behave in a certain way. Under normal circumstances, a shape-memory alloy "remembers" its low-temperature shape, but upon heating to recover the high-temperature shape, immediately "forgets" the low-temperature shape. However, it can be "trained" to "remember" to leave some reminders of the deformed low-temperature condition in the high-temperature phases. There are several ways of doing this.A shaped, trained object heated beyond a certain point will lose the two-way memory effect.

PULSE DETONATION ENGINE

Mr.Inayat Quadri 4th Year mechanical

The PDE is a big improvement over the pulsejet in that it makes use of detonation waves to compress and combust the fuel-oxidizer mixture, whereby the temperatures and pressures released and the available power are much higher than pulsejets, gas turbine engines or rockets. Although the amount of energy released by deflagration and detonation is the same, because detonation is supersonic, the energy release occurs at a much faster rate.Therefore,theoretically PDEs can be made smaller and faster than present day engine systems.

The operational frequency of PDEs can range from a few tens to a few hundred cycles per second1. The uninstalled thrust produced by the engine is a function of the number of detonation tubes, area of cross section of each tube, frequency of operation and exit velocity of the exhaust gases. The PDE has a simple geometry, consisting essentially of a tube which is filled with fuel and oxidizer, before the mixture is detonated. These benefits that PDEs can offer have spurred a growing worldwide interest in PDE research since the early 1990s, with the aim of realizing the next generation of propulsion systems to replace current gas turbines.

Detonation is a supersonic combustion process, which may be modeled as a shock wave followed immediately by a reaction flame front, together traveling through the mixture at several times the speed of sound of the unburnt gas mixture. On the other hand, deflagration is a subsonic combustion process, ranging in speeds from less than a few m/s to nearly 1000 m/s, well below the speed of sound.

Basic PDE:-

The basic PDE has a very simple structure, as seen in, consisting essentially of a constant area tube, with valving to control the supply of fuel and oxidizer, an ignitionsystem, and a nozzle for accelerating the flow if the engine is to be applied for propulsion.

The PDE combustion chamber is filled with fuel and oxidizer during the fill stage. The time taken for the filling is denoted as tf. When the fuel-oxidizer mixture is filled to the required

volume, the combustion stage commences when a spark (arc or any other ignition initiator) is fired to start ignition. A detonation wave is soon created that moves through the mixture and causes the pressure and temperature behind it to rapidly shoot up. The time taken for the detonation wave to take shape and to move through to the end of the combustion chamber is denoted by tc. The next stage is the blow down stage, when a series of rarefaction waves travel upstream into the combustion chamber and reflect off the end wall, causing the high pressure burnt gases to exit the combustion chamber at a high speed. The time taken for the blow down stage is denoted by tb . This is then followed by the purge stage, when fresh air is blown through to clean and cool the tube before the fill stage starts again. The time taken for purging the tube with fresh air is denoted by tp .

The purging process is very important as this cools the tube and prevents the fresh fueloxidizer mixture from igniting due to residual heat on entry into the combustion chamber. It also protects the structure of the tube from heat buildup. The amount of time that the fuel-oxidizer mixture remains within the detonation tube is known as the residence time. At higher speeds,

the residence time is very short, in the order of a few ms, and the combustion has to be initiated and advanced to detonation in as short as 1 to 5 ms.

The frequency of operation f is the inverse of the time period, measured in Hz. Thus reducing the period increases the operational frequency. The filling and purging processes take a larger fraction of the time period. If the tube is long, filling and purging take longer amounts of time and only low frequencies are possible. However, the tubes cannot be shorter than the distance it takes for DDT to occur. The above processes hold true for an airbreathing PDE or one operating in a rocket mode, where the oxidizer and fuel are carried on board the aircraft. Such a configuration is known as a pulsed detonation rocket engine (PDRE).

ADVANTAGES OF PDE :-

Simplicity of design. Detonation wave does the work of compressing the gas, producing extremely high pressure ratios, higher temperatures.No requirement of high compression ratios and thus no compressor required.Constant volume combustion offers better efficiencies than constant pressure combustion in Brayton cycle.Better thrust, Isp, fuel efficiencies.Higher weight to thrust ratios.

DISADVATAGES OF PDE :-

Extremely noisy, parts subject to extreme mechanical fatigue, hard to start detonation, not practical for current use.

FUTURE OF PDEs:-

Many developers have high hopes that the PDE will ultimately become the most cost-effective method of propelling supersonic sub-orbital craft. The ultra-high compressions obtained by detonation offer the potential for much better fuel-efficiency than even the best turbojet, and the fact that they are an air-breathing engine reduces the fuel-load and increases safety when compared to rocket motors.

THE GENTLE RISE OF THE MACHINES

Pramod kumar Das , 3rd year, Mechanical

Machines -as the word impinges its image on the mind of the listener has become a part of human‟s everyday life. Machines has served the homo sapiens from the time of Greek philosopher Archimedes around the 3rd century BC. Perhaps the first example of human made device designed to manage power is the hand one, made by chipping Flint to form a wedge. Since 3rd century BC till today, Machines have been a great achievement of humansof all time. Machines that has its root only to the mechanical has served the mankind since then till now. The latest development of the machines is the discoveries of Robotics. Once there was a time when philosophers used the name of machines that can do the work according to the human thinking in their philosophy to lure people and today is the time when we are surrounded by these machines from all sides. Machines are nothing but an incredible invention of mankind which has converted the burdensome human life to a most comfortable life. Today we can do a large work with just a single click of our finger. Machines has not only decreased the human efforts but have made this enormous earth a small place, leaving behind the earth it has facilitated its wings to the space. Every single element that we use in our daily life is machine. Our kitchen appliances, our automobiles, jets, ships, spacecraft, etc. are nothing but machines. Machines are incredible boon to mankind which has been raised due to the development in mechanical sectors. So keep calm and join Mechanical Engineering and serve the World.

SOME INTRESTING FACTS

Aswini Kumar, 2nd Year mechanical

- ***The strongest muscle in the body is the tongue***
- ***The strongest muscle in the body is the tongue.***
- ***Coca-Cola was originally green***
- ***The most common name in the world is Mohammed***
- ***The 2015 most popular mobile app was Facebook.***
- ***When the moon is directly overhead, you will weigh slightly less.***
- ***Camels have three eyelids to protect themselves from the blowing desert sand***
- ***There are two credit cards for every person in the United States***
- ***People who are using a computer blink 66% less than those who aren't.***
- ***If a statue of a person in the park on a horse has both front legs in the air, the person died in battle.***

  If the horse has one front leg in the air, the person died as a result of wounds received in battle.

  If the horse has a all four legs on the ground, the person died of natural causes.

TECHNICAL QUIZ

Abhisek Chanda, 3rd Year MECHANICAL

1. Second law efficiency is defined as
   a) actual exergy intake / minimum exergy intake
   b) minimum exergy intake / actual exergy intake
   c) actual exergy intake / maximum exergy intake
   d) maximum exergy intake / minimum exergy intake

2. .Availability function for a closed system is given by
   a) u-pv-Ts
   b) u+pv+Ts
   c) u-pv+Ts
   d) u+pv-Ts

3. Which of the following is true for a steady flow system?
   a) mass entering = mass leaving
   b) mass does not enter or leave the system
   c) mass entering can be more or less than the mass leaving
   d) none of the mentioned

4. Rankine efficiency of a steam power plant
   improves in summer as compared to that in winter
   improves in winter as compared to that in summer
   is unaffected by climatic conditions
   none of the above.

5. In Rankine cycle the work output from the turbine is given by

change of internal energy between inlet and outlet

change of enthalpy between inlet and outlet

change of entropy between inlet and outlet

change of temperature between inlet and outlet.

6. The thermal efficiency of theoretical Otto cycle

a) decreases with increase in CR b) increases with decrease in CR c) does not depends upon the PR

d) NOT

7. In Otto cycle, heat addition takes place at

a) constant temperature b) constant pressure c) constant volume d) none of the mentioned

The efficiency of an Otto cycle is increased by increasing

Answers

1. A
2. B
3. D
4. C
5. B
6. C
7. B

Mechanical Poem

Bhakti Prasad Sahu ,3rd yr ,Mechanical

A bridge engineer, Mr. Crumpett

A bridge engineer, Mr. Crumpett,

Built a bridge for the good River Bumpett.

A mistake in the plan

Left a gap in the span,

But he said, "Well, they'll just have to jump it."

GREAT QUOTES

Subhakanta sahoo, 3rd yr mech

- ***A leader is one who knows the way, goes the way and shows the way." —john C. Maxwell***
- ***"The challenge of leadership is to be strong but not rude; be kind, but not weak; be bold, but not a bully; be humble, but not timid; be proud, but not arrogant; have humor, but without folly." —Jim Rohn***
- ***"Nothing will work unless you do." —Maya Angelou***
- ***"A good leader takes a little more than his share of the blame, a little less than his share of the credit." —Arnold H. Glasow***
- ***"The quality of a leader is reflected in the standards they set for themselves." —Ray Kroc***
- ***"Average leaders raise the bar on themselves; good leaders raise the bar for others; great leaders inspire others to raise their own bar." —Orrin Woodward***
- ***"The mediocre teacher tells. The good teacher explains. The superior teacher demonstrates. The great teacher inspires." — William Arthur Ward***
- ***"I alone cannot change the world, but I can cast a stone across the water to create many ripples." —Mother Teresa***