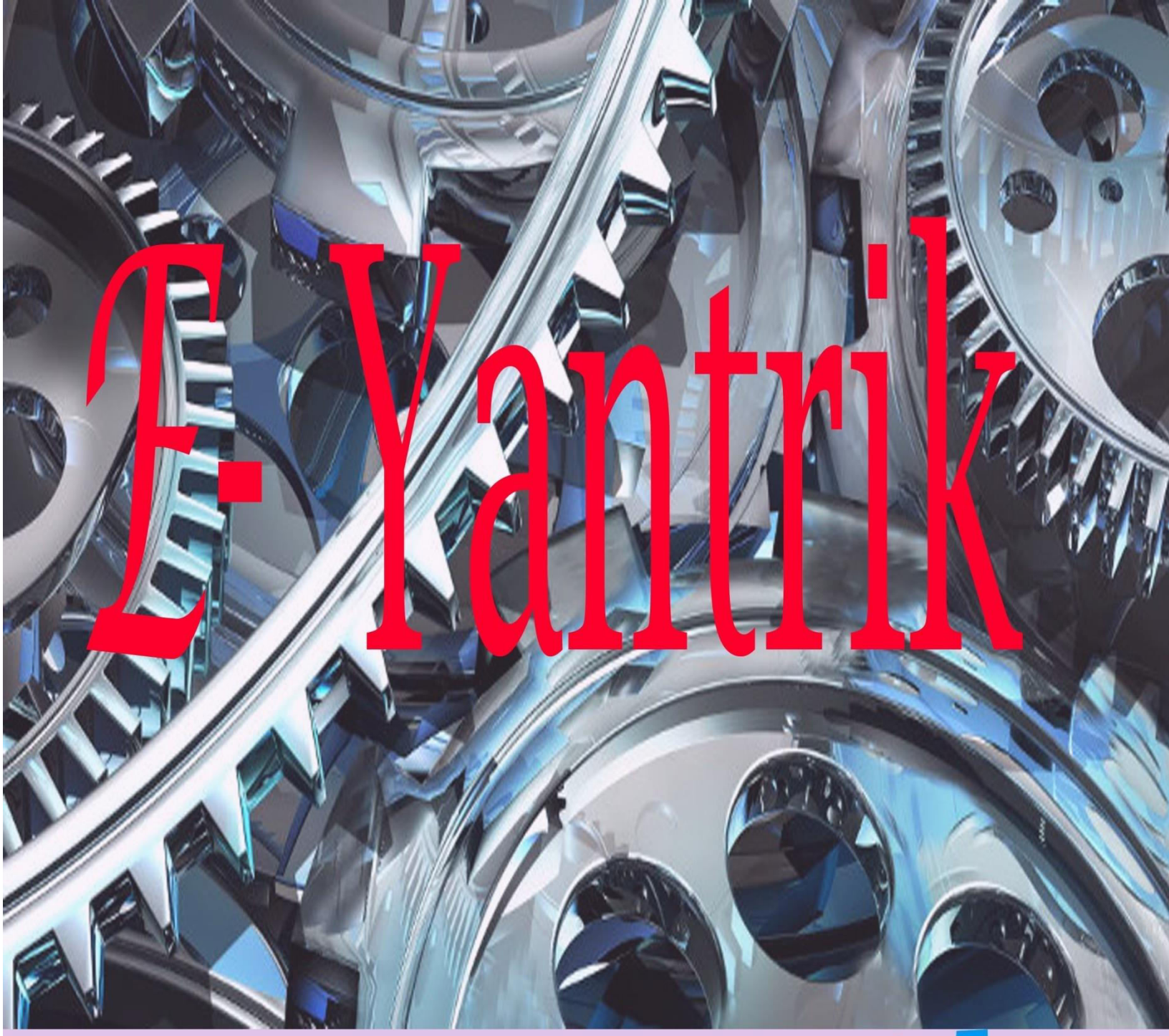

E-Yantrik

Volume: 6

2nd :Issue

GIFT

Student Editors: *Amit Kumar*

Suraj Prakash

Faculty Editor: *Swagatika Acharya*

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,

Dr. Nabnit Panigrahi

H. O. D, Mechanical

Gandhi Institute For

Technology, Bhubaneswar

From the Editor's Pen

Dear Readers,

Greetings from Department of Mechanical & Engineering!

It is my pleasure to congratulate the team that has taken the initiative for producing this E-YANTRIK magazine. It is great to find a considerable number of articles, technical quiz poems and abbreviation that certainly prove that our staff and students are adequately equipped and possess necessary skill sets to express their talent. Reading this E-YANTRIK magazine would definitely be an inspiration and motivation for all students and staff to contribute even more to the forthcoming issues.

I hope that everyone would continue to give their full efforts to keep the momentum and continue to enhance the standards of the magazine.

Thanks & Regards,

Prof. Swagatika Acharya

Asst. Prof., Dept. of Mechanical

Editor, E-Yantrik

- **Article**

1. *Experimental laser microgrooving*
2. *Space materials*
3. *Stratification by fuel injection and positive ignition*
4. *Development and fabrication of smart Waste segregator*
5. *A study on implementation of simulation at Operational level in manufacturing system*

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

EXPERIMENTAL LASER MICROGROOVING

Prof. Chita ranjan Kumar

The recent technology has been advancing to infinite extent in search of newer materials and alloys with high hardness, strength, and less weight which are very difficult to be machined with the conventional machining processes for achieving the required accuracy and precision. Nowadays, there is a vast demand for the well finished products of alumina ceramic materials with high accuracy and complex integrated designs. Such features on a component can be achieved only through the advanced manufacturing process, especially by laser beam machining.

In case of micromachining, the feature size is less than 1 mm. Hence, lasers are increasingly employed for a precise micromachining because their beams can be focused accurately on microscopic areas, and attributed to a number of advantages which are normally applicable to whole range of the materials processing applications, like, non-contact processing, high productivity, eradication of the finishing operations, minimized cost of processing, and enhanced the quality of product, maximize material utilization, green manufacturing and minimize the heat affected zone. The above-cited advantages can only be obtained with appropriate selection of process parameters.

Researchers have employed various methods: multiple regression analysis (MRA) and artificial neural network (ANN) for mathematical modeling in order to predict the responses and Taguchi method, response surface method(RSM), genetic algorithm (GA), particle swarm optimization (PSO) for optimization the controlled process parameters during laser micromachining process that have been explored as productivity and reliable tool in advanced computing technology for high-quality frameworks since it gives a straightforward, skilled, and systematically optimize the output, such as cost, quality, and performance.

The proper utilization along with appropriate adjustment of machining controllable process parameters is of main importance for achieving fine grade of microgrooves, which generally utilize proper time and effort due to the frequently changing behavior of the laser micromachining process. To avoid the misleading conclusion, statistical analysis is performed for the proposed RSM model (UWD) by employing ANOVA in order to check its adequacy and validity.

Empirical models proposed for the technological response characteristic such as upper width deviation have R-Square value is set close to one and P-value less than 0.05, which ensures the greater statistical

significance with the excellence of fit for the model. The normal probability plot ensures that the residuals distributed fairly near to a straight line showing the normality dispersion of errors as well as implying the sources associated with the model are significant. Response optimization employing PSO technique shows the optimal setting of machining variables in laser micro grooving, The suggested multiple approaches (experimental, statistical, and computational) are reliable methodologies for improving laser micro grooving process and can be used in model predictive control, real time process monitoring, and optimization in different machining processes.

SPACE MATERIALS:-THE NEW MISSION

Ipsita Das ,4th yr Mechanical

The start of the space era was ignited by the development of rockets, materials, and electronics. This odyssey was propelled by the human thirst for knowledge and adventure. Space endeavor relies heavily on materials with outstanding properties – they must survive in an environment that combines ionizing radiation, extreme temperatures, and micrometeorites. Certain missions add extra threats: low earth and geostationary orbits inflict ferocious ozone-induced degradation, while deep-space missions involve high levels of ionizing radiation and, eventually, extremely low temperatures.

The main requirements for space materials are: light weight (to reduce mission costs); resistance to ionizing radiation (accelerated electrons, protons, and ions); multifunctional capabilities; smart features; self-healing capabilities; and outstanding thermal stability. Space materials research is concentrated on composites obtained by dispersing nanofillers with designed functionalities within different polymeric matrices. The polymeric matrix gives low weight. An appropriate choice may also add structural and thermal stability. Polymers also act as a radiation shield because of their high hydrogen content, reduced radioactive activation, and light weight.

Much research is focused on multifunctional materials combining radiation shielding, structural capabilities, and electrical conductivity, such as polymer-carbon nanotube composites. Nanotubes can enhance the mechanical strength of polymers and add high electrical and thermal conductivity. Minute amounts give polymers antistatic features, while concentrations as low as 1 wt.% trigger electrical conductivity. The intimate relationship between the electrical and mechanical properties of these composites adds smart capabilities. The correlation between the position of Raman peaks of nanotubes embedded within polymeric matrices and the stress acting on the composite opens up an alternative route for predicting their mechanical failure.

Self-healing capabilities will protect polymers and composites from the effect of ionizing radiation, temperature, and micrometeorites. Further advances are required to extend the temperature range over which the polymeric matrix is protected and to decrease the size of the microbubbles containing the healing agent.

Importantly, polymers are not ideal matrices – most are sensitive to ionizing radiation, temperature, and atomic oxygen. Synergistic effects caused by competition of these degradation processes have been reported.

The search for space materials includes other nanomaterials for extreme temperatures, conversion of light into electricity, and optical and magnetic applications. Nanomaterials are extremely appealing, as they promise reduced volume, weight, and energy consumption. However, their survival in the space environment has yet to be assessed. The details of the interaction between ionizing radiation and nanometer-sized features are not yet fully understood and a new theoretical description – nanodosimetry – is under development. New projects that would make our presence in space easier and cheaper are maturing. The solar sail will offer an alternative method of space travel. The discovery of carbon nanotubes revived the space-elevator project. But, while the mechanical properties of nanotubes are promising (with a Young's modulus of about 1 TPa), they degrade when the size is increased toward the micron scale. To fulfill the technical requirements for the elevator cable, it is mandatory to project the outstanding properties of nanotubes to larger scales, and to understand and control adhesion between nanotubes and polymers. Both space shuttle disasters were caused by material failures; the cooling of a polymeric O ring below the glass transition temperature caused the Challenger disaster and a piece of insulating foam peeling from the external tank and striking a reinforced carbon-carbon panel triggered the Columbia tragedy. So, it is mandatory to understand the behavior of materials in space and to improve Earth-bound simulation by focusing on synergistic effects triggered by the combined action of ionizing radiation and temperature.

US president George W. Bush's new vision revives space exploration. Most debate concerns the emphasis on manned missions. Opponents focus on robot-based exploration, citing the reduced price and risk. The reallocation of NASA's limited resources could endanger previously approved projects – already, some missions have been delayed or abandoned. But manned missions should accelerate materials development. Enhanced safety requirements will fuel a search for materials with self-healing and smart capabilities, and open up new research, such as in-space repair and *in situ* fabrication of materials. But, for safe missions, NASA must contribute and support materials science research, improve Earth-bound simulation, and improve estimation of the lifetime of materials in space.

STRATIFICATION BY FUEL INJECTION AND POSITIVE IGNITION

Akar Mishra , 4th year, Mechanical

Many types of IC Engines, two types, namely diesel and petrol engines, are well established. Each one of them has certain limitations. The full load power characteristics of petrol engine are very good, but the degree of air utilization is also high. Diesel engines have part load characteristics but have poor air utilization. Comparatively, the emission characteristics for the diesel and petrol engines are poor due to the high peak temperatures. In the actual operation, basing on the stoichiometric fuel–air mixture ignition the fuel efficiencies are very much lowered in both the engines. From the observation, we see that the engine runs at part load and max power conditions. Therefore, an engine is to be developed, which can combine the advantages of diesel and petrol engine and also avoid the many of their disadvantages. In that course of action stratified charge engine is one, which is midway of the heterogeneous CI engine and homogeneous SI engine. Here an overview of stratified charge engine working and its combustion by fuel injection with positive ignition method is presented.

The main objective of stratified engine feeds the rich mixture through a separate inlet valve to generate a swirl in the combustion chamber. By this, weak mixture enters the cylinder in general and then the vortex comprising alternate layers of rich and lean mixtures are formed. As the rich mixture is directed on to the spark plug points which ignite and burns the mixture throughout the cylinder. This stratified engine concentrates on the mixture near the spark plug whose AF ratio is <14:1 and the remaining mixture in the cylinder which is a lean mixture whose AF ratio is ≥50:1. As like the direct ignition system in the diesel, here it uses the same process to run at high compressions. However, to gain the ability of quick mixing and clean burning to avoid the poor combustion it relies on gasoline-like Otto cycle which is found in the diesel.

The combustion chamber is designed in such a way that at the spark plug a pre combustion chamber is created which helps to produce a rich mixture close to the spark plug. For this modification, piston head is also done and where the cavity which is in the form of a toroidal and imparts swirling movement to the air in the cylinder during compression. It is also provided with a thin fan-shaped fuel spray (see Fig. 1). In this, through the transfer system, the engine pulls only the air and the fuel injector which is placed at the top of the cylinder head will inject the required amount of fuel for the combustion in the form of a fuel cloud into the cylinder.

On comparison, stratified charge direct injection engines possess redolently higher fuel economy than conventional throttled engines. The heat losses can be decreased in such way that because of

stratifying the fuel–air mixture will be in the centre of the combustion chamber which will keep the burnt products away from the walls.These all show the sign of reduced fuel consumption which leads to a reduction in the engine exhaust emissions. According to the present scenario, reduction in emissions is encouraged, and so these types of engines with necessary developments are to be implemented.

DEVELOPMENT AND FABRICATION OF SMART WASTE SEGREGATOR

Pullab Dutta , 4th year, Mechanical

The magnitude of waste disposal in public areas is increasing due to increase in population, change in the lifestyle of the human beings, and improper measures for reducing and recycling of waste. There is an urgent need for creating awareness among the public and spread motivation among the youth of the country. The problem can be overcome by segregation at source. The main motto is to develop a smart waste segregator to collect recyclable and reusable waste. It tries to reduce human interference by automating the system to the maximum extent possible. A model is developed and fabricated to meet the requirements for separating different kinds of wastes using various mechanisms and electronic circuits which include conveyor, Arduino board, sensors, motors, etc. It involves various mechanical operations for setting up the system and programming to make the electronic circuits work.

The model can segregate wet waste, dry waste, and metal waste. The mechanical part of the system involves preparing conveyor frame and mechanisms for material transfer, whereas the electronic circuits include programming the movement of various mechanical elements to perform their jobs automatically. Waste alignment will happen with the help of resistance plates provided at both ends of the conveyor belt. Sensors with specific applications are used to identify wet, dry, and metal wastes. Bins are monitored using sensors to avoid overflowing of waste.

The magnitude of waste disposal in public areas is increasing due to increase in population, change in the lifestyle of the human beings, and improper measures for reducing and recycling of waste. Dumping wastes in open sites result in deterioration of soil quality affecting vegetation adversely. Rats, flies, and other insects which carry diseases such as malaria, dengue fever, etc. are attracted toward these sites which infect people around. Dumping waste in crowded areas increases the vulnerability of spreading more diseases. In general, to reduce the waste disposal in public, the government has arranged bins at several places, vehicles for collecting waste on daily basis, etc. Further development measures are undertaken by setting up segregation and waste

management plants where different kinds of wastes are separated manually or using mechanical components and recycled in respective plants.

There is a need for a system which can segregate different types of waste at the source so that the wastes which are recyclable and reusable can be processed further and turned out into useful end products. The waste segregation system has a very good scope for development in the current situation of the country in terms of waste management and awareness of people toward it. A system can be built with an application of multiple branches of engineering. Both mechanical and electronics play a vital role in building this system and proper research and survey are required to get better ideas about the requirements and specifications of the model that is concentrated on.

A STUDY ON IMPLEMENTATION OF SIMULATION AT OPERATIONAL LEVEL IN MANUFACTURING SYSTEM

Asutosh Singh , 4th year, Mechanical

Manufacturing simulation has a greater role to play in this era of smart manufacturing. Global competency can be achieved when industries are able to execute planned strategies at an operational level. Over the years simulation has been extensively used at strategic levels, where decisions concerning productivity, design, process reengineering, alternative model selection to bemade, have long term effects. Many research experts have pointed at the need to use simulation at an operational level in manufacturing system. This paper explains the significance of simulation at an operational level. In order to analyze the above said research problem, a tin container production line in LVT containers plant unit at Hubballi, Karnataka, India was considered for the study. The main objective in this study is to maximize production rate through minimizing serious bottlenecks identified at various stages by proposing several scenarios without altering existing facility.

Rapid growth of expertise and constant change in the customer requirement have decreased product life cycle. Nowadays industries are driven by customers unlike old traditional hierarchy rules, wherein flow of control was from top to bottom. “Lean manufacturing” is what industries people refer to. Thus, the processes that are carried at an operational level play a significant role in the path of moving toward lean manufacturing. At the operational level, industries require to collect, merge, and analyze various data set generated on the floor from unit production to equipment operations data. The effective execution of real-time analytics and

monitoring is possible through better-informed decision making. We known that physical implementation of change can be difficult task. But through simulation, designer can actually test and verify several design alternatives as they would be having detail analysis of existing system's behavior over a period of time. Given that over the years simulation has been used mostly for decision support in situations that are several months and maybe years ahead.

Simeonov and Simeonovova in their paper have considered a case study on coffee production describing potential uses of simulation for increasing productivity and profit. Minegishi and Thiel explained simulation study on industrial management behavior in food industries. But there has been too little concern toward implementing simulation in plans and schedules on a weekly or even daily basis from industry people. In order to explore the effects of implementation of simulation at the factory floor, we conducted a simulation study at a tin container production line. The objective of the study was to maximize production rate through minimizing serious bottlenecks identified at various stages by proposing several scenarios without altering existing facility. Simulation study is carried out through several orientation visits to the plant and getting familiar with the system components. Among available simulation software's such as Arena 10.0, ProModel, Process model, etc., Arena 10.0 was used to run real-time simulation and build the system model. With the simulation run results, congestions in different stages on the production line were determined. Through simulation experiments, several scenarios were developed to identify feasible solution to increase production rate. Introduction of change into existing system always has a cost attached to it.

SOME INTRESTING FACTS

Akar Mishra,4th year,Mechanical

- *Over 3.8 billion people use the internet today, which is 40% of the world's population.*
- *8 billion devices will be connected to the internet by 2020.*
- *More than 570 new websites are created every minute.*
- *There are over 3.5 billion searches per day on Google.*
- *Every minute 24 hours of video is uploaded to YouTube. More video content is uploaded to YouTube in a 60-day period than the three major U.S. television networks created in 60 years.*
- *By 2020, video will account for about 80% of all internet traffic.*
- *340,000 tweets are sent per minute.*
- *500 million tweets are sent per day.*
- *Facebook has more than 2 billion active users who have an average of 155 friends.*
- *There are more than 300 million photos uploaded to Facebook every day, 800 million likes per day, and 175 million love reactions per day.*
- *Your online reputation and privacy worst enemies are WhatsApp, Snapchat, Instagram, Google, Facebook, and Twitter.*
- *Facebook is a divorce lawyers best friend. In fact, 1 in 7 divorces are blamed on Facebook.*
- *Over 4.2 billion data records were stolen in 2016*
- *90% of the world's data has been created in the last couple years.*
- *250 million hours of TV shows and movies are watched daily via Netflix*
- *More than 56 million hours of music is streamed daily.*

Technical Quiz

Mr. Suraj Biswas, 2nd Year mechanical

1. A power cycle continuously converts ____ into ____
a) heat, heat

B) work, heat

C) heat, work

D) work, work

2. The path followed in a vapour power cycle is
a) boiler-condenser-turbine-pump

b) boiler-turbine-condenser-pump
c) boiler-turbine-pump-condenser

d) boiler-pump-turbine-condenser

3. The correct sequence of strokes in a four-stroke SI engine is
a) intake->compression->exhaust->expansion

b) intake->expansion->compression->exhaust
c) intake->exhaust->compression->expansion

d) intake->compression->expansion->exhaust

4.The pressure in cylinder is ____ the atmospheric value during exhaust stroke and ____ it during intake stroke.
A) above, below

b) below, above

c) equal to, equal to

d) equal to, above

5.The work of compression is ____ the shaft work.
A) positive of

b) negative of

c) equal to

d) less than

6.A simple U-tube manometer can measure negative gauge pressures.
A) True

b) False

7.In case of any orifice, velocity always remains constant and hence discharge can be calculated.
A) True

b) False

8.The train value of a gear train is
a) equal to velocity ratio of a gear train

b) reciprocal of velocity ratio of a gear train
c) always greater than unity

d) always less than unity

9.A differential gear in automobiles is used to
a) reduce speed

b) assist in changing speed
c) provide jerk-free movement of vehicle

d) help in turning

10.A closed feed water heater system

a. has high heat transfer capacity
b. requires pump at each heater to handle the large feed water stream
c. requires only single pump regardless of the number of heaters
d. does not require any pump as the extracted steam and feed water are not allowed to mix

Answers

1. B
2. B
3. C
4. A
5. B
6. C
7. B
8. C
9. B
10. A

MECHANICAL POEM

Abinash Mohapatra 2nd year,Mechanical

MECHANICAL DOLL

And that night I was a mechanical doll

and I turned right and left, to all sides

and I fell on my face and broke to bits,

and they tried to put me together with skillful hands

And then I went back to being a correct doll

and all my manners were studied and compliant.

But by then I was a different kind of doll

like a wounded twig hanging by a tendril.

And then I went to dance at a ball,

but they left me in the company of cats and dogs

even though all my steps were measured and patterned.

And I had golden hair and I had blue eyes

and I had a dress the color of the flowers in the garden

and I had a straw hat decorated with a cherry.

GREAT QUOTES

Kiran kumar pakal ,2nd yr mechanical

1. ***"Never write anything that does not give you great pleasure. Emotion is easily transferred from the writer to the reader."***

   - Joseph Joubert

2. ***"The most valuable of all talents is that of never using two words when one will do. "***

   - Thomas Jefferson

3. ***"It is perfectly okay to write garbage as long as you edit brilliantly."***

   - C. J. Cherryh

4. ***"Writing without revising is the literary equivalent of waltzing gaily out of the house in your underwear."***

   - Patricia Fuller

5. ***"Write your first draft with your heart. Rewrite with your head."***

   - Mike Rich

The End