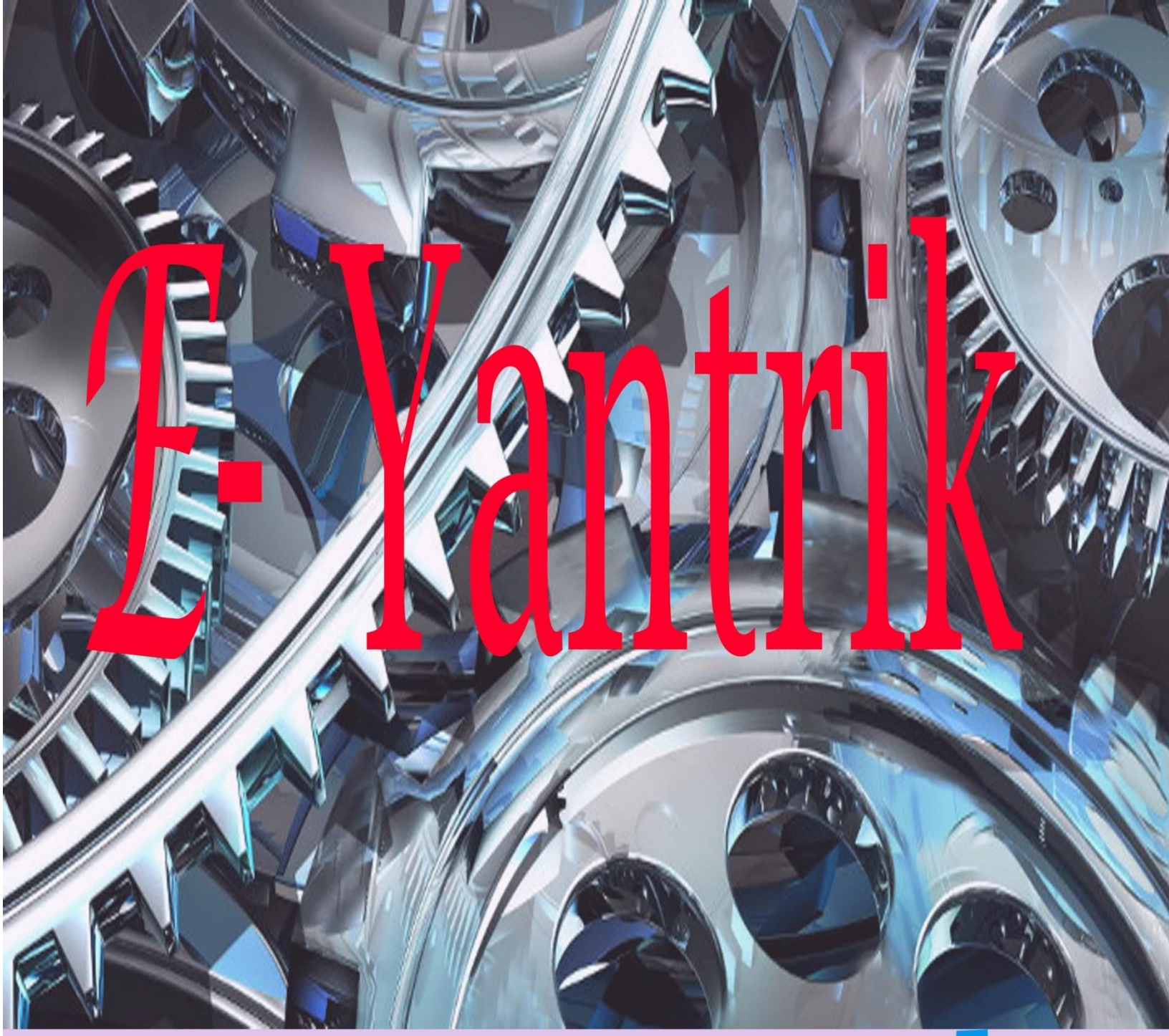


E-Yantrik

Volume: 7

2nd :Issue

Student Editors: *Suraj Kumar Gouda*

Rakesh Dalai

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,

GreetingsfromDepartmentofMechanicalEngineering!

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,

GreetingsfromDepartmentofMechanical&Engineering!

It brings me immense pleasure to bring the second issue of the E-YANTRIK to you. E-YANTRIK has only just begun to explore the potential of the new digital media. I look forward to some awesome output from our students in the coming years. And I wait with bated breath for Best of this year' s to have a laugh, turn a thought, and to try and form a mental picture of what we really are like.

Campus magazine is important not just for capturing the currents and moods of the time, but also because they are an archive we can visit later to view ourselves from the distance t hat the years will bring. I am glad E-YANTRIK is putting together literary pieces and reviews of the major contributions of GIFT.

E-YANTRIK is by the students, of the students and for the students to bring out their creative skills.

I can just thank and congratulate everyone involved in making this effort a grand success by contributing their articles to spread knowledge and to all of those who have put their heart in to this.

Thanks & Regards,

Dr. Alok Mohaptra,

Dept. of Mechanical

Editor, E-Yantrik

PULSE DETONATION ENGINE

Prof. Ayushman Nayak

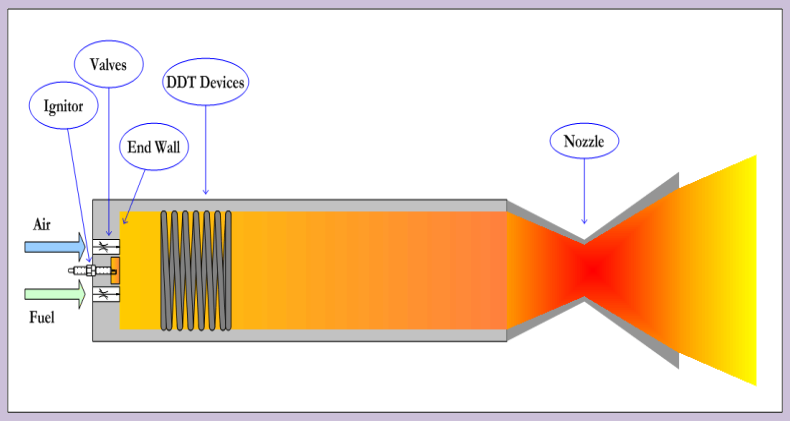
The PDE is a big improvement over the pulsejet in that it makes use of detonation waves to compress and combust the fuel-oxidizer mixture, whereby the temperatures and pressures released and the available power are much higher than pulsejets, gas turbine engines or rockets. Although the amount of energy 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.

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



Schematic of a basic pulse detonation engine with valves at the inlet and a nozzle at the exhaust.

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.

FUTURE OF PDE- 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.

Unfortunately there are still a number of negative issues that will need to be addressed. Firstly there's the noise -- if you think regular pulsejets are loud then you'll be absolutely blown-away by the noise levels created by a PDE. Then there's the issue of vibration. Although multiple engines could possibly be synchronized to fire in a manner that reduces vibration levels, they will still be significantly greater than those generated by turbojet or rocket motors. High levels of vibration place incredible demands on the materials from which motors and airframes are constructed.

SYNTHESIS OF NANO ALUMINA

Rakesh Chandra Biswal ,3rd yr ,Mechanical

A ball mill is a type of grinder used to grind, blend and sometimes for mixing of materials for use in mineral dressing processes, paints, pyrotechnics, ceramics and selective laser sintering. It works on the principle of impact and attrition: size reduction is done by impact as the balls drop from near the top of the shell.

The figure below shows the motions of the balls and the powder. Since the rotation directions of the bowl and turn disc are opposite, the centrifugal forces are alternately synchronized. Thus friction resulted from the hardened milling balls and the powder mixture being ground alternately rolling on the inner wall of the bowl and striking the opposite wall. The impact energy of the milling balls in the normal direction attains a value of up to 40 times higher than that due to gravitational acceleration. Hence, the planetary ball mill can be used for high-speed milling.

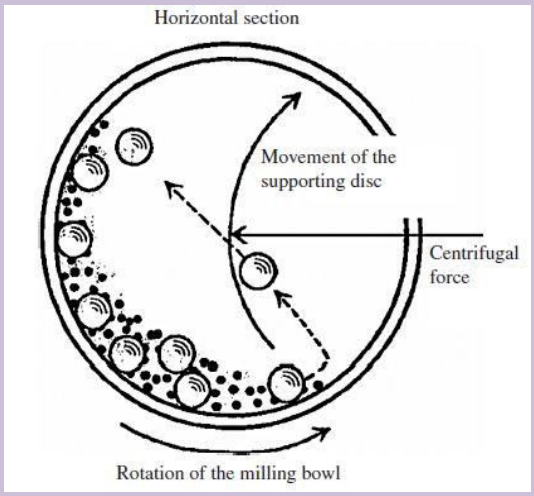
Component

1) High Energy Ball Mill:

2) Acetone

3) Balls

4) Spatula, Beaker, container



Advantages of Ball milling:

Ball milling boasts several advantages over other systems: the cost of installation and grinding medium is low; it is suitable for both batch and continuous operation, similarly it is suitable for open as well as closed circuit grinding and is applicable for materials of all degrees of hardness.

Fig: Ball Mill

The process is very user friendly and easy to handle. It is widely used and accepted method but there are some cons available with the method. The principal cost is very high. Precaution and carefulness must be adopted by the practitioner to carry out. The repeatability and reversibility of the method is yet to be investigated.

SMART MATERIALS

Bhabani shankar tripathy, 3rd yr ,Mechanical

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. 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%).

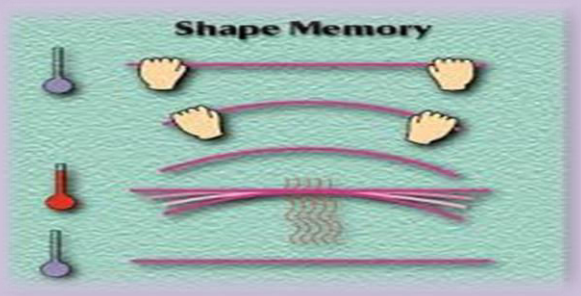
Example: Quartz; Aluminum Nitride; Barium Titanate; Gallium Phosphate; Lead

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.

ALTERNATIVE FUELS

Mr. Sunil panda,4th yr mechanical

Alternative fuel, also known as non-conventional fuels, is any material or substance that can be used as a fuel, other than fossil fuels, or conventional fuels like petroleum (oil), coal, propane, hydrogen, and natural gas. The term "alternative fuels" usually refers to a source of which energy is renewable. Some well known alternative fuels include biodiesel, bioalcohol (methanol, ethanol, and butanol), chemically stored electricity (batteries and fuel cells), hydrogen, non-fossil methane, natural gas, vegetable oil and other biomass sources. You probably know that plant oil byproducts are nutritious and healthy. But did you know they can power a

car? Find out how plant oils, as well as animal fats, are used to create the environmentally friendly fuel -- biodiesel. Now let us discuss how BIODIESEL works as alternative fuel.!

BIODIESEL: - Biodiesel refers to a vegetable oil (or) animal fat based diesel fuel consisting long-chain of alkyl (methyl, ethyl) esters. Biodiesel is typically made by chemically reacting lipids (e.g., vegetable oil, animal fat) with an alcohol this process is known as Transesterification. Biodiesel is simple to use, biodegradable, nontoxic, and essentially free of sulfur and aromatics. This is the long chain of stearic acid ethyl ester with ethanol

the use of vegetable oils for engine fuels may seem insignificant today but such oils may become, in the course of time, as important as petroleum and the coal-tar products of the present time."!Despite the widespread use of fossil petroleum-derived diesel fuels, interest in vegetable oils as fuels for internal combustion engines was reported in several countries during the 1920s and 1930s and later during World War II, many countries had tested and used vegetable oils as diesel fuels during this time.!Research into the use of sunflower oil, and refining it to diesel fuel standards, was initiated in South Africa in 1979. By 1983, the process for producing fuel-quality, engine-tested biodiesel was completed and published internationally. Throughout the 1990s, plants were opened in many countries for the production of biodiesel fuel, and finally in 2008, ASTM published new Biodiesel Blend Specifications Standards.

PREPARATION OF BIODIESEL: - Biodiesel is commonly produced by the transesterification of the vegetable oil or animal fat feedstock. There are several methods for carrying out this transesterification reaction. Generally transesterification is the process of exchanging the organic group R" of an ester with the organic group R' of an alcohol. These reactions are often catalyzed by the addition of an acid or base. mixture vigorously for five minutes. After a half hour we can observe a colour change in them mixture there will be a dark layer at the bottom and a liter cover on the top that dark layer is glycerin and biodiesel will be at the top now collect the biodiesel carefully for getting pure .

A PRACTICAL ATTEMPT TO IMPROVE PERFORMANCE OF HEAT EXCHANGER

Mr. Pradipta Sahoo,3rd year mechanical

Heat Exchanger is a device used intensively for heat transfer form fluid. Thus all various type of heat exchanger .Our concentration is on shell and tube type heat exchanger .We will design the heat exchanger by bell delware method to increase heat transfer by using various material and geometries. Shell-and-tube heat exchangers are widely used in many industrial areas, and more than 35–40% of heat exchangers are of this type due to their robust geometry construction, easy maintenance, and possible upgrades.

Heat exchangers are devices that provide the transfer of thermal energy between two or more fluids at different temperatures. Shell and tube heat exchangers are the most versatile type of heat exchangers. They are used in the process industries, in conventional and nuclear power stations and they are proposed for many alternative energy applications. The enhancement in heat transfer rate between two or more fluids in heat exchanger is mainly achieved by optimizing the design of heat exchanger and operational parameters.

Optimizing the operational parameters play a key role in the enhancement of heat transfer rate after the design of heat exchanger. The transfer of heat to and from process fluids is an essential part of most chemical processes. The most commonly used type of heat-transfer equipment is the ubiquitous shell and tube heat exchanger; the design of which is the main subject of this report. The word “exchanger” really applies to all types of equipment in which heat is exchanged but is often used specifically to denote equipment in which heat is exchanged between two process streams. Exchangers in which a process fluid is heated or cooled by a plant service stream are referred to as heaters and coolers.

SOME INTRESTING FACTS

Mr. Biswaranjan tarai,4th yr mechanical

- ***The average fuel cost across all vehicles is 14.45 cents per mile, or about 23 miles per gallon.***
- ***The best selling car of all-time is the Toyota Corolla.***
- ***The U.S. consumes about half of the world's gasoline.***
- ***Ferrari manufactures a maximum of 14 cars a day.***
- ***Every year, over $60 billion worth of car maintenance goes unperformed.***
- ***The average consumer spends $400 a year on diagnostics, scheduled maintenance, and tune-ups.***
- ***Traffic congestion wastes three billion gallons of gas each year.***
- ***The first windshield wipers were hand-operated.***
- ***The most commonly stolen vehicle is the Honda Accord.***
- ***White is the most popular car color.***
- ***The total average repair cost in the U.S. is $305.55, including $202.28 for parts and $103.27 for labor.***

Technical Quiz

Mr. BISWARANJAN TARAI, 4th Year MECHANICAL

1. Segmental chips are formed during machining
   - **A.** mild steel
   - **B.** cast iron
   - **C.** high speed steel
   - **D.** high carbon steel
2. Cemented carbide tool tips are produced by powder metallurgy.
   - **A.** True
   - **B.** False
3. If the diameter of the hole is subject to considerable variation, then for locating in jigs and fixtures, the pressure type of locator used is
   - **A.** conical locator
   - **B.** cylindrical locator
   - **C.** diamond pin locator
   - **D.** vee locator
4. Side rake angle of a single point cutting tool is the angle
   - **A.** by which the face of the tool is inclined towards back
   - **B.** by which the face of the tool is inclined sideways
   - **C.** between the surface of the flank immediately below the point and a plane at right angles to the centre line of the point of the tool
   - **D.** between the surface of the flank immediately below the point and a line drawn from the point perpendicular to the base
5. Internal gears can be made by
   - **A.** hobbing
   - **B.** shaping with pinion cutter
   - **C.** shaping with rack cutter
   - **D.** Milling

6. In order to prevent tool from rubbing the work _____ on tools are provided.
   - **A.** rake angles
   - **B.** relief angles
7. The silicon carbide abrasive is chiefly used for grinding
   - **A.** cemented carbide
   - **B.** ceramic
   - **C.** cast iron
   - **D.** all of these
8. Drilling is an example of
   - **A.** orthogonal cutting
   - **B.** oblique cutting
   - **C.** simple cutting
   - **D.** uniform cutting
9. A round nose tool may be fed eitner from left to right end or from right to left end of the lathe bed.
   - **A.** Yes
   - **B.** No
10. When the cutting edge of the tool is dull, then during machining
    - **A.** continuous chips are formed
    - **B.** discontinuous chips are formed
    - **C.** continuous chips with built-up edge are formed
    - **D.** no chips are formed

Answers

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

MECHANICAL POEM

Mr. Abhisek Panda , 4th Year mechanical

Mechanical Ballerina

Drowning in the sea of red
cartridges stuck inside her head
singing to the pigeon man
about all the stars again
how they crunch under her toes
there she goes

She dines by the candlelight
golden beetles lined with blight
in her velvet dressing room
withered flowers in full bloom

Drowning in the sea of red
cartridges stuck inside her head
singing to the pigeon man
about the dawn once again
how the curtain rises low
on last show

Cigarettes in the first row
burning slow
Rustling of the stolen feathers
burning slow
City shining through the smoke
burning slow

GREAT QUOTES

Mr. Aswini Kumar, 3rd Year mechanical

1. *"If you can tell stories, create characters, devise incidents, and have sincerity and passion, it doesn't matter a damn how you write."*

   - Somerset Maugham

2. *"And by the way, everything in life is writable about if you have the outgoing guts to do it, and the imagination to improvise. The worst enemy to creativity is self-doubt."*

   - Sylvia Plath

3. *"If the book is true, it will find an audience that is meant to read it."*

   - Wally Lamb

4. *"I went for years not finishing anything. Because, of course, when you finish something you can be judged."*

   - Erica Jong

5. *"Believe in yourself! Have faith in your abilities! Without a humble but reasonable confidence in your own powers, you cannot be successful or happy."*

   - Norman Vincent Peale

6. *"If I waited for perfection, I would never write a word."*

   - Margaret Atwood