

Nayan Chourey
A2D4D50220056

B.Tech.(CSE)
Sec:- B.

Mechanical Assignment.

Ans 1 (a) :- The internal combustion engines are the engines in which the combustion of a fuel occurs with an oxidizer (usually air) in a combustion chamber that is an integral part of the working fluid flow circuit. In an integral combustion engine the expansion of the high temperature and high pressure gasses produced by combustion apply direct force to some component of the engine. The force typically to piston, turbine blades, or a nozzle.

Internal combustion engines are classified in the following types:-

- i) According to type of fuel used:- gas engine, Petrol engine, light oil engine (Kerosene), Heavy oil engine (Diesel).
- ii) according to working cycle:- Otto cycle engine, Diesel cycle engine, Dual combustion engine.
- iii) according to all the speed of the engine:- Low-speed, medium speed engines, High speed engine.

- iv) According to method of ignition:- spark engine,
compression ignition.
- v) According to arrangement of the cylinder:- Horizontal,
inline, V-engine,
opposed piston,
Radial engine.
- vi) According to method of cooling:- air cooled, water cooled.

Ans 1 (b):- The welding process is a fabrication process that joins materials, usually metal or thermoplastics by causing solid coalescence.

In welding process, metal is melted to bridge the parts to be joined, so that on solidification of the weld metal the metal parts become united. welding is often done with pressure, sometimes in conjunction with heat, to produce weld.

There are two categories of welding process:-

i) Fusion process:- The surface of two components to be joined are cleaned, placed close together and heated, forming a pool of molten metal that connects the components. A filler rod may be used to add metal to joint.

This category includes processes such as:-

- Oxyacetylene welding.
- Shielded welding.
- Gas metal arc welding
- Gas tungsten arc welding.

(ii) Solid Phase Process:- The metals to be joined are not melted. Instead they are heated, usually by friction generated by sliding the parts together under a normal load. This softens the metals and removes surface contamination. This sliding is then stopped, the normal load is increased and two surfaces are joined together.

It is widely used to join antisymmetric components in two different types of steel.

Ans 2 :- (1) :- The casting process is a manufacturing process in which molten material such as metal is poured into the casting cavity or mold of the desired shape and allowed to harden and solidify within the mold. After solidification the casting is taken out by ejecting or breaking the mold.

Continuous casting process:- The metal is first liquefied and poured into a tundish, which is a container that leads to the mold mold that cast the steel.

- (2) The tundish is placed about 80-90 ft. above the ground level and the whole process of casting uses gravity to operate. The tundish is constantly supplied by the molten metal to keep the process going.
- (3) further, the impurity and slag are fitted filtered in tundish before they move into the mold. The entrance of the mold is filled with inert gases in the environment like oxygen.
- (4) The molten metal moves swiftly through the mold and it does not solidify in it. The entire mold is closed cooled with water that flows around the outer surface. Typically, steel casting solidify along the walls of the casting and then gradually moves to the interior of the steel casting.
- (5) The metal casting moves outside the mold with the help of different sets of rollers. While one set of roller bend the cast, another set will straighten it. This helps to change the direction of flow of the steel slab from vertical and horizontal.

Ans 2 (b) :- four stroke petrol engine. works on combustion of fuel ignites by the spark generated by an external spark plug.

The four stroke engine works on Otto cycle. The power generation process is divided into four thermal processes. Each process is linked with piston stroke. These processes are known as Intake stroke, Compression stroke, Expansion stroke, Exhaust stroke.

Intake stroke:- Air and fuel mixture enter into the cylinder during suction stroke. In the suction stroke piston moves from top dead center to bottom dead center and simultaneously inlet valve opens. Due to less atmospheric pressure inside cylinder the air fuel mixture is sucked through inlet port. Volume of cylinder increases and the pressure remains unchanged.

Compression stroke:- The piston moves from bottom dead center to top dead center and compresses the enclosed air fuel mixture in the cylinder. It compresses the mixture into $\frac{1}{10}$ times to its original volume. Both the inlet and exhaust valve remain closed during this stroke.

Expansion stroke:- Both the valves remain closed during the start of this stroke but when the piston just reaches the B.D.C. the exhaust valve opens. When the mixture is ignited with the spark plug which produces hot gases to throw piston.

On Exhaust Stroke: The gasses from which the work has been done now become useless, and are made to escape through exhaust valve. to the atmosphere.

Ans 3 :- (a) Boiler:- A steam boiler means any closed vessel exceeding 22.75 ltr. in capacity and which is used expressively for generating steam under pressure.

Classification of Boilers:-

(i) According to the circulation of gasses:-

→ Fire-tube boiler

→ Water-tube boiler

(ii) According to circulation of water:-

→ free circulation.

→ forced circulation.

(iii) According to the number of tubes:-

→ Single tube boiler.

→ Multi-tube boiler

(iv) According to the nature of use:-

→ Stationary boiler

→ Locomotive boiler.

→ Marine boiler

(v) According to the nature of fuel used:-

→ Fuel fired

→ Gas fired.

→ Liquid fuel

→ Electricity fired.

→ Nuclear fired

(vii) According to the presence of boiler:-

- High pressure
- Medium pressure.
- Low pressure.

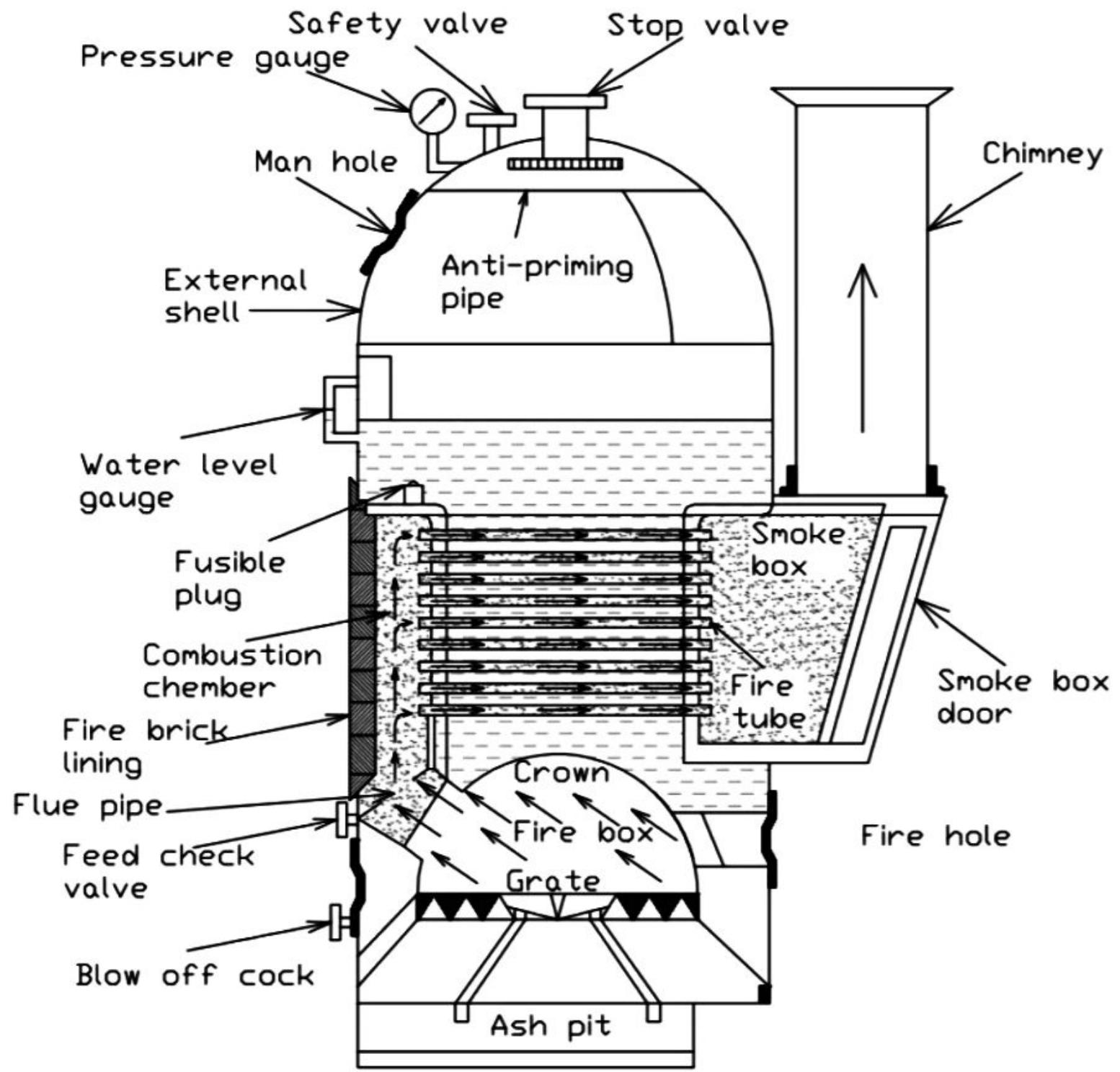
(viii) According to the axis of boiler shell:-

- Vertical boiler
- Horizontal boiler.

Ans 3 (b) :- Function of riser:- It ensure the complete filling of the cavity so that the casting can be produced. Riser functions can be divided into four categories.

- Use to compensate shrinkage.
- Ensure complete filling of cavity.
- Make the dense / compact casting.
- Allow gasses to escape so that gas defect free casting can be obtained.

Ans 4:- (a) :- Cochran boiler is a multi-tubular vertical fire tube boiler having a number of horizontal fire tubes. It is the modification of a simple vertical boiler where the heating surface has been increased by means of a number of fire tubes. The efficiency of this boiler is much better than simple vertical boiler.



Ans 4(b):- Allowance can be classified into following types:-

(iii) Shrinkage Allowance:- During cooling of material in the casting process, the material is getting shrinkage. But shrinkage allowance taking place in 1st two stages is called liquid shrinkage. Shrinkage in 3rd stage is called solid shrinkage.

(iv) Draft Allowance:- Making the vertical surfaces of the pattern into inclined surfaces is called draft allowance.

(v) Shrink Allowance :- To maintain the required size of the casting the original size of pattern has to be reduced by an amount called shrink allowance.

(vi) Machining Allowance :- The extra dimensions provide on the Casting and it will be removed by machining after the casting has been completed.

(vii) Distortion Allowance :- To get the vertical legs of U-shaped, the original pattern has to be bent inverse so that during solidification, the legs are bending outwards and becoming vertical legs.

Ans 5 (i) :- There are several mounting which is having several works inside and outside the boiler like:-

- Water level indicator.
- Safety valves.
- Stop valve.
- Pressure gauge.
- Feed check valve.
- Blow off valve.

There are multiple accessories, Boiler accessories are used to increase efficiency. ~~Accessories~~ Accessories are:-

- Feed pump.
- Economizer
- Air preheater
- Super heater.

Pressure gauge:- A pressure gauge is fitted in front of a boiler in such a position that the operator can conveniently read it. It reads the pressure of steam in the boiler and is connected to the steam space by siphon tube.

Economizer:- It is a plant in which the feed water is preheated before it enters into a boiler. The heat is taken from waste flue gasses of the boiler.

Ques 5 (b) :- Engineering materials:-

Metals:-

- Ferrous Alloys
 - Carbon Steel
 - Low alloy Steel.
 - Tool Steel.
 - Stainless steel
 - Cast iron

• Aluminium Alloys:-

- Nickel alloys.
- Copper Alloys.
- Titanium Alloys.

→ pottery

Polymers :-

- Thermo plastic polymers.
- Thermosetting polymers.
- Elastomers.

Ceramics:-

- Glass
- Cement
- Clay product
- Refractories
- Abrasives.

Composites:-

- Particulate composites
- Fibrous
- Laminated.

Ans 6:- The following are the mechanical properties of materials :-

1. Strength, 2. Flex

1. Strength :- It enables the metal to resist deformation load.

- It's a capacity of material to withstand destruction under the action of external load.

2. Plasticity:- It is a ability to undergo some permanent deformation without rupture.

- It only take place after the elastic range has been exceeding

3. Hardness:- The resistance of a material to force penetration or bending is hardness.

- It is a ability of a material to resist scratching, abrasion, cutting or penetration.

4. Toughness:- It is a property of a material which enables it to withstand shock or impact.

5. Brittleness:- A Property of a material which enables it to withstand permanent deformation.

- They will break rather than bend under shock or impact.

6. Stiffness:-

- It is a mechanical property
- It is a resistance of a material to elastic deformation on deflection.

7:- Ductility:-

- It enables material to be drawn out into a thin wire.

Ans 7:- Draught may be defined as the small pressure difference which causes a flow of gas to take place. In case of a boiler the function of the draught is to force air to enter the fire and through through a boiler furnace and fire, and to discharge the products of combustion to atmosphere by ~~air~~ via stack or chimney.

The draught can may be classified into the following two types:-

1. Natural
2. Artificial.

1. Natural Draught:- Natural draught system employs a tall chimney. The chimney is a vertical tall masonry structure or reinforced concrete. It is formed for enclosing a column of flue gasses to produce the draught.

It removes the gasses high enough to prevent air pollution. The draught is produced by this tall chimney due to the temperature difference of hot gasses in chimney and cold internal air outside the chimney.

Artificial Draught: The draught produced by the chimney is affected by the atmospheric conditions. It has no flexibility, poor efficiency and tall chimney required. In most of the modern power plants, the draught applied must be freedom of atmospheric condition, and it should have more flexibility.

Ans 81- Forging is a process in which metal deforms plastically to another requires shape and size with the help of hand or machine forging with a certain temperature. Forging is done by two process :- hand and machine.

Open dies forging:- In this process once we heat the workpiece to the required temperature than we put the workpiece on the anvil by the use of tongs. And now we strike on it with the use of hammer for the required shape and size. The length of workpiece decreases and the cross-section area of the workpiece increases.

Closed dies forging:- To perform the operation we must have two dies (upper & lower) lower is fixed and upper is movable. In this operation the workpiece is under the dies to perform the operations as you can think from the name.

Ans 9:- Arc welding is a welding process that is used to join metal to metal by using electricity to create enough heat to melt metal, and the melted metals when the cool result in a binding of the metals.

Arc welding process:-

1. An AC or DC power source, fitted with whatever controls may be needed, is connected by work cable to the workpiece and by the an electrode cable to electrode holder by of some type. which make electrical contact with the welding electrode.
2. An arc is created across the gap when the energized circuit. and the electrode tip touches the workpiece and is withdrawn yet still within close contact
3. The arc produced a temperature of about 6500° centigrade at the tip.
4. This heat melt both the base metal and the electrode producing a pool of molten metal sometimes called a crater. The crater solidify behind the electrode as it is moved along the joint. The result is fusion bond.

Arc welding applications:-

1. Industrial construction.
2. Shipbuilding
3. Farm Equipment.
4. Railway Department.
5. Highway equipment etc.

Ans 10:- Milling is a process performed with a machine in which the cutters rotate to remove the material from work piece present in the direction of the angle with the tool axis. With the help of the milling machine one can perform many operations and functions starting from small objects to large ones.

It is a very common manufacturing processes used in machinery shops and industries. to manufacture high precision products and parts in different shapes and sizes.

A Lathe machine consist of the following operations:-

- Centering
- facing
- Turning
- Chamfering
- Knurling.
- Thread cutting
- Drilling
- Boiling.
- Reaming
- Spinning.
- Tapping
- Parting off.