

Mechanics Assignment

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B.Tech CSE

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(A)

Ans 1 Internal combustion Engine:- In this, combustion takes place within working fluid of the engine, thus fluid gets contaminated with combustion products.

Petrol Engine is an example of internal Combustion Engine, where the working fluid is a mixture of air & fuel.

Internal combustion engine may be classified as:-

① spark Ignition Engines. (SI engine)

② Compression Ignition Engines (CI engine)

SI Engine:- An Engine in which the combustion process in each cycle is started by use of an external spark.

CI Engines: An Engine in which Combustion process starts when the air self ignites.

Ans 2 (B) Welding process:- Welding is a fabrication process where two or more parts are fused together by means of heat, pressure or both forming a join as the parts cool. Welding is usually used on metals & thermoplastics but can also be used on wood.

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The completed welded joint may be referred to as a weldment.

Ans ② (A) Casting process:- Casting is a manufacturing process in which a liquid material is usually poured into a mould, which contains a hollow cavity of the desired shape, & then allowed to solidify. The solidified part is known as casting, which is ejected or broken out of the mould to complete the process.

Continuous casting is the process where molten metal is solidified into a semi-finished billet, bloom or slab for subsequent rolling in the finishing mills.

(B) Four stroke petrol Engine :- It is an IC engine in which the piston completes four separate strokes while turning the crankshaft. A stroke refers to the full travel of the piston along the cylinders, in either direction. The four separate strokes are termed :-

① Intake :- This stroke of the piston begins at T.D.C & ends at B.P.C. In this stroke the intake valve must be in the open position. The piston is moving downward as air is being sucked in the downward motion against the piston.

② Combustion of the air-fuel mixture occurs in a very short but finite length of time with the piston

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near T.D.C.

- (3) Expansion stroke / Power stroke :- With all valves closed the high pressure created by combustion process pushes the piston away from T.D.C.
- (4) Exhaust stroke : By the time piston reaches B.D.C exhaust blowdown is complete, but the cylinder is still full of exhaust gases at approx atm. pressure.

Ans (3)(A) A steam generator is a form of low water content boiler, similar to a flash steam boiler. The usual construction is as a spiral coil of water tube, arranged as a snig, or monotube coil.

Classification of Boilers :- It is classified in different types based on their working pressure & temperature, fuel type, draft method, size & capacity, & whether they condense water vapour in the combustion gases.

Power Station Boiles : mostly are boilers of large capacity & high parameters.

Industrial Boiles :- being used for industrial production & heating

Marine Boiles : used as power for ships.
→ Classified by structure :-

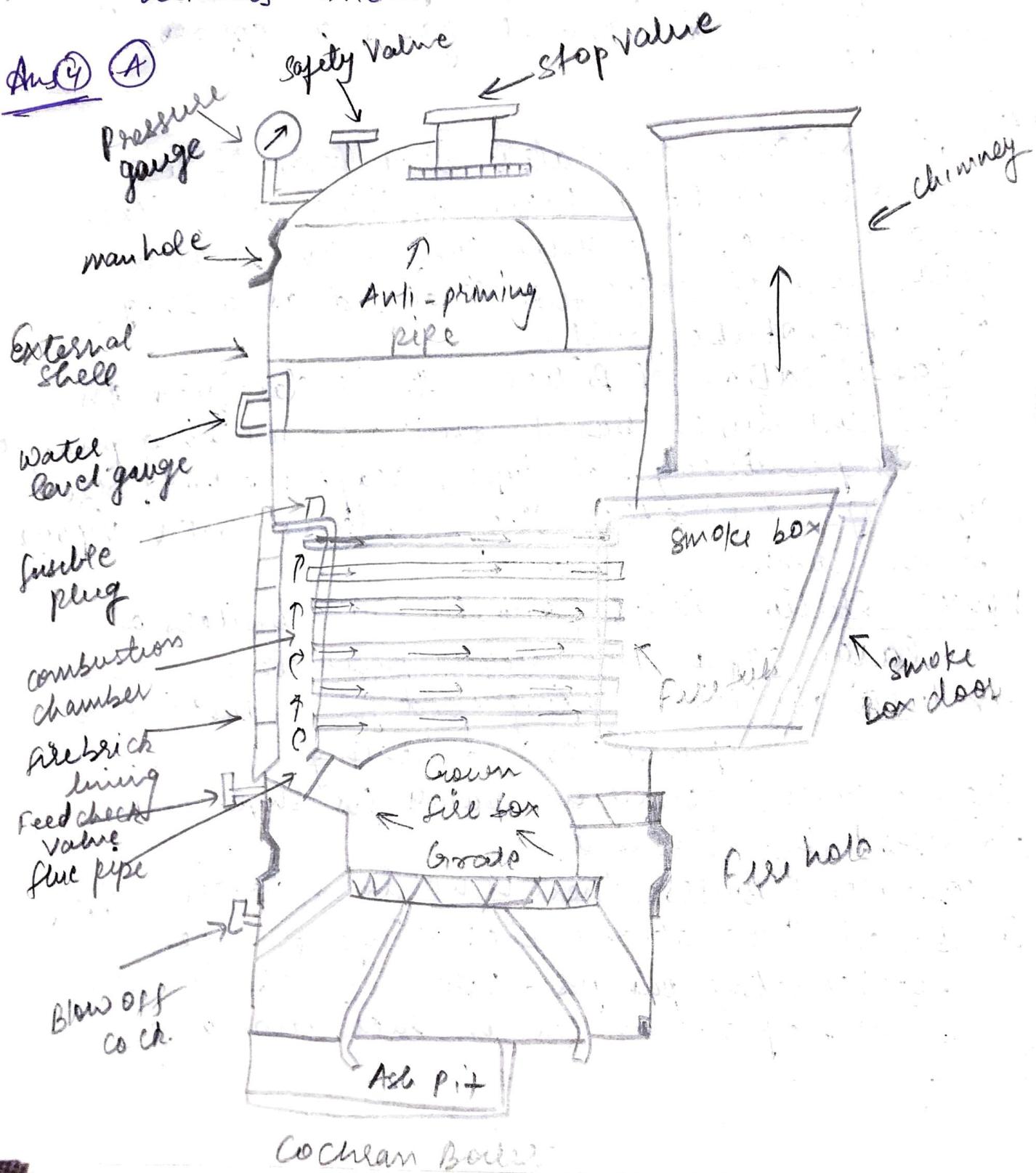
Concurrent Boiles : There is no drum, water supply

Combined Circulation Boiles :- There are recirculating pumps. When boiler head is low, operation is in recirculation operation.

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③ Function of Rises in casting :-

- ① Provide extra metal to compensate for the Volumetric shrinkage.
- ② Allow mold gases to escape.
- ③ Provide extra metal pressure on the solidifying mold to reproduce mold details more exact.



An@③ Various Types of Allowances:

Allowances Pattern Allowances

① Shrinkage Allowances:-

Shrinkage is defined as the reduction in the dimension of the cast during the cooling or solidification process.

It of three types :-

- (a) Liquid shrinkage
- (b) Solidification shrinkage
- (c) Solid shrinkage

② Draft Allowances : When the pattern is removed from the mould, the parallel surface to the direction at which the pattern is withdrawn gets damaged slightly & gets converted into tapered surfaces.

③ Machining Allowances : The finish & accuracy in sand casting is generally poor.

Extra material provided on the casting to enable their machining or finishing to the required size, accuracy & surface finish.

④ Boiler mounting : These are the components generally mounted on the surfaces of the boiler to have safety during operation. These are the essential parts of boiler without which the boiler operation is not possible. The following are the important mountings of the boiler.

- ① Water level indicator
- ② Safety Valve.

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- ④ Steam stop valve
- ⑤ Feed check valve
- ⑥ Main hole.

Boiler Accessories :-

- ① Feed water pump :- It is used to feed water to the boiler.
- ② Injector :- Function of the injector is the same as that of feed pump.
- ③ pressure reducing Valve :- It is to maintain constant pressure on its delivery side.
- ④ Air pre heater :- Function is to heat the air before it enters the combustion chamber.
- ⑤ Super heater :- It is used to convert dry saturated steam into super heated at the desired temperature.
- ⑥ Steam drizzles :- It is used to separate water particles from steam before it is supplied to the point of application.

(B) Engineering materials:-

Metals:

- Ferrous Alloys
- Carbon steel
- Low Alloys steel
- Tool steel
- Stainless steel
- Cast Iron
- Aluminium Alloys

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- Nickel Alloys
- Copper Alloys
- Titanium Alloys.

Polymers

- Thermoplastic Polymers
- Thermosetting polymers
- Elastomers

Ceramics

- Glass
- Cements.
- clay products
- refractories
- Abrasives

Composites

- Particulate Composites
- Fibrous Composite
- Laminated Composites.

~~Ans ②~~ Material stress strain :- stress it tells us how big of a force applies to an area.

$$\sigma = F/A$$

Strain has no unit as it is a ratio of lengths.

Young's Modulus :- The simp. mech. properties - stiffness & elasticity
formula:

$$E = \sigma / \epsilon \text{ (MPa)}$$

Yield strength :- It is the value most often used in engineering calculations -

Tensile Strength: The resistance of a material to breaking under tension.

Plasticity: It is a mechanical property of material that shows the ability to deform under stress without breaking while retaining the deformed shape after the load is lifted.

Toughness: It is a combination of strength & plasticity. It is often defined as a material's ability to absorb energy without cracking.

Hardness: Hardness Values shows that a material resists localised pressures.

Brittleness: It means that a material breaks without noticeable plastic deformation.

Ans 7) Boiler draught: It may be defined as the small difference between the pressure of outside & that of gases within a furnace or chimney at the grate level, which causes flow of air/hot flue gases to take place through boiler.

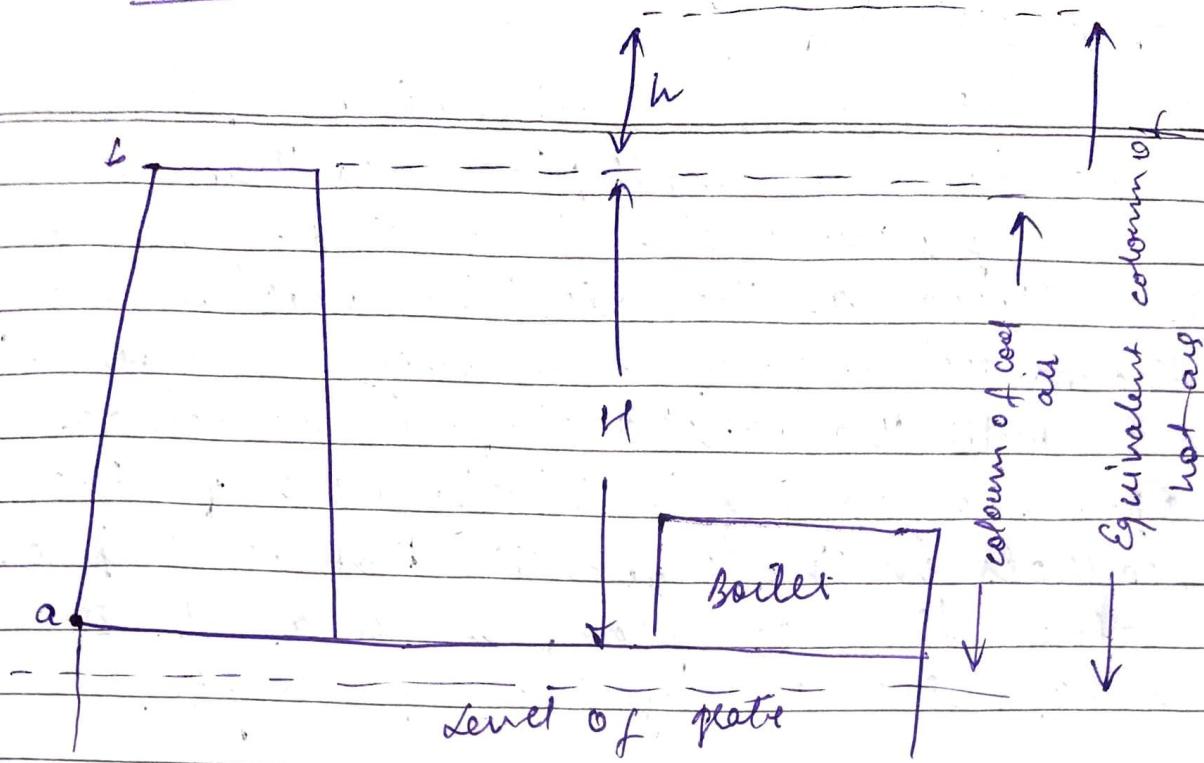
Classification:

① Natural Draught

② Artificial Draught

Natural Draught: In this case if we consider a condition when fire is not lighted, the pressure at the grate level surface is the same at all points on the surface i.e., at the chimney base as well as on the grate & we assume its value to be P_1 .

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(b) Forced draught: It often maintains a pressure above atm, in the boiler setting, therefore, the flue gases may be forced out into the boiler room through cracks or leaks where boilers are hand-fired, flame may shoot out of firing door, if the draught is not cut out before the doors are opened.

(c) Balanced draught: It is a combination of the forced & induced draught system. The forced draught fan supplies air at a sufficient pressure for the air to pass through the fuel bed either direct or through air heater.

An (8)

Forging: It is a manufacturing process involving the shaping of a metal through hammering, pressing, or rolling.

Open die forging:

It is the process of deforming a piece of metal between multiple dies that do not completely enclose the material. The metal is altered as the dies 'hammer' or 'stamp' the material through a series of movements until the desired shape is achieved.

Open die forging is widely used for the products in small quantity that are simple, safer than complex, such as discs, rings, sleeves, cylinders & shafts.

Closed die forging:

It is also known as impression die forging. It is a metal forming process that compress a piece of metal under high pressure to fill an enclosed die impression. For some special shapes, second forging operations is required to reach final shapes & dimensions.

Ans 9 Arc welding is a type of welding process using an electric arc to create heat to melt and join metals. A power supply creates an electric arc between a consumable or non-consumable electrode & the base material using either direct or alternating currents.

Applications:

- used in the welding of sheet metals
- For welding thin, ferrous & non ferrous metals.

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- used to design pressure & pressure vessels.
- The developments of piping in industries.
- Used in the domain of automotive & home furnishing.
- Industries of ship building
- Auto body restorations
- Railroads.
- The developments of manufacture of aircraft & aerospace.

Ans 10

Milling process: It is the process of machining using rotary cutters to remove material by advancing a cutter into a workpiece. This may be done varying direction on one or several axes, cutter head speed, and pressure of the machine operations.

Lathe machine that rotates the workpiece about an axis to perform different operations such as turning, facing, knurling, grooving etc. operations

- ① Turning operation
- ② Facing operation
- ③ Chamfering operation.
- ④ Knurling operation
- ⑤ Thread cutting operation
- ⑥ Filing operation
- ⑦ Polishing operation
- ⑧ Grooving operation
- ⑨ Spinning operation
- ⑩ Spring operation
- ⑪ Foaming