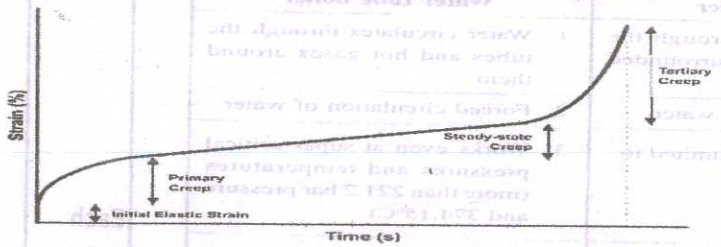
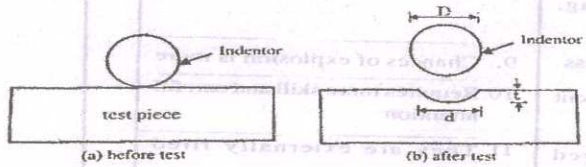
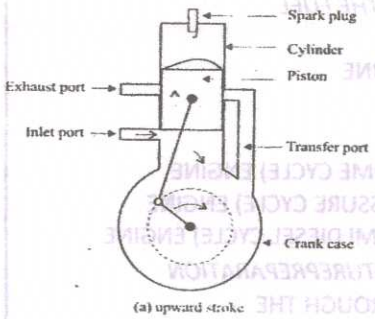
SCHEME OF VALUATION

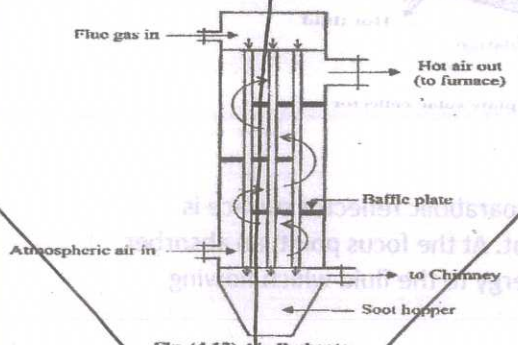
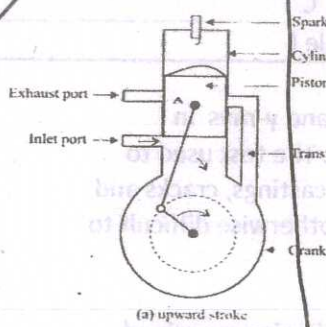
Scoring Indicator

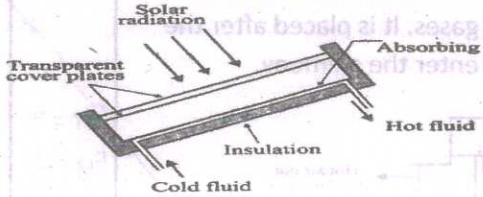
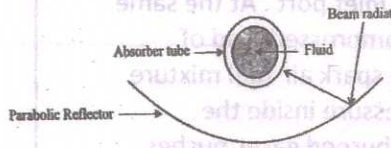
Rivision: 2015			Course Code: 2021		
Qst No.	**Scoring Indicator**		**Split up score**	**Sub total**	**Total**
	PART A				
I (1)	It is the propert of a material that can absorb energy before failure. OR The ability of a material to withstand repeated loading or twisting without failure.		2	2	
I (2)	1. Spark test, 2. Appearance test, 3. Magnetic particle test, 4. Liquid penitrant test, 5. Ultrasonic test, 6.Radiography test. (any 4)		1/2*4	2	
I (3)	It is the ratio of mass of dry steam actully present in the mass of wet steam which contains it. Dryness fraction = Mass of dry steam/total mass of wet steam		2	2	
I (4)	Thedowered movement of the piston during expansion stroke, air-fuel mixture (air in the case of petrol engine) in the crank case compressed and this compressed air -fuel mixture is transferred to upper part of cylinder tht helps to remove the burned gass present. This process is known as scavenging		2	2	
I (5)	1.Solar power plant, 2. Geothermal power plant, 3. Wind power plant, 4. Tidal power plant, 5. Thermoelectric power plant. (any 4)		1/2*4	2	5X2=10
	PART B				
II(1)	The slow and steady deformation of a material under a constant load is called creep. This is a time dependent deformation at elevated temperature. The creep is the stress for a specific rate of strain at constant temperature and is represented as % of elongation /hr. 		Exp= 4 Fig=3	6	
II(2)	$BHN = \frac{\text{Load on the ball}}{\text{Area of indentation}} = \frac{2P}{\pi D\left[D - \sqrt{D^2 - d^2}\right]}$ Where, P – load applied in kg, D – diameter of ball indentor in mm, d – diameter of impression in mm 				

II(2)	- The Brinell hardness test is mostly used for determining the hardness of metallic materials such as cast iron, steel, aluminum etc. -The test consist of forcing a hardened steel ball of diameter 'D' under a load P in to the test piece. - Specimen is placed on the anvil, the hand wheel is rotated so that the specimen along with anvil moves up and contact the ball. - The desired load applied mechanically or hydraulically. - The load is maintained for 10 to 15 seconds and impression made on the test piece. - The diameter of indentation is measured by means of a micro scope - The brinell hardness number obtained from the relation	Exp= 4 Fig=2	6
II(3)	**Gray cast iron** : a) Carbon present in the form of graphite flakes , b) fracture surface has gray apperance, c) % of carbane 2.5% to 3.8%, d) Obtained by slow cooling of pig iron , e) Lowest melting point, high fluidity, good machinability, high vibration damping capacity etc, f)Used for making machine tool bodies, automobile parts, fly wheel pullys etc **Malleable cast iron** : a) Carbon present in the form of temper carbon in ferrite matrix, b)Produced by annealing white cast iron castings, c) Heating slowly to 900-1000 C and kept at this temperature for 25 to30 hrs d) % of carbon 2.3%, e) it posses malleability,toughness, shock resistance, weldability, f)For manufacture of gearhousing, spanners, crank shaft etc.	Each point carry 1/2 12*1/2	6
II(4)	**4.6.1 Comparison between fire tube and water tube boilers** **Fire tube boiler** / **Water tube boiler** 1. Hot gases flow through the tubes which are surrounded with water / 1. Water circulates through the tubes and hot gases around them 2. Free circulation of water / 2. Forced circulation of water 3. Steam pressure is limited to 20. – 30 bar / 3. Works even at super critical pressures and temperatures (more than 221.2 bar pressure and 374.15°C) 4. Usually used for heating purpose only / 4. Used for power generation & heating purpose 5. Rate of steam production is less, limited to 9000 kg/hr / 5. Rate of steam production is high up to 5,00,000 kg/Hr 6. Overall efficiency up to 85% / 6. Overall efficiency up to 92% 7. Construction is difficult / 7. Construction is simple 8. Various parts are not accessible for cleaning, repairing and inspection / 8. Parts are more accessible 9. Chances of explosion is less / 9. Chances of explosion is more 10. Requires less skill for efficient working / 10. Requires more skill and careful attention 11. They are internally fired boilers / 11. They are externally fired boilers	Each point carry 1/2 12*1/2	6

II(4)	**Classification of Internal Combustion Engine** a. *ACCORDING TO THE BASIC ENGINE DESIGN* - RECIPROCATING ENGINE (USE OF CYLINDER PISTON ARRANGEMENT) - ROTARY ENGINE (USE OF TURBINE) b. *ACCORDING TO THE TYPE OF FUEL USED* - PETROL ENGINE - DIESEL ENGINE - GAS ENGINE (CNG, LPG) - ALCOHOL ENGINE (ETHANOL, METHANOL ETC) c. *ACCORDING TO THE NUMBER OF STROKES PER CYCLE* - FOUR STROKE - TWO STROKE ENGINE d. *ACCORDING TO THE METHOD OF IGNITING THE FUEL* - SPARK IGNITION ENGINE - COMPRESSION IGNITION ENGINE - HOT SPOT IGNITION ENGINE e. *ACCORDING TO THE WORKING CYCLE* - OTTO CYCLE (CONSTANT VOLUME CYCLE) ENGINE - DIESEL CYCLE (CONSTANT PRESSURE CYCLE) ENGINE - DUAL COMBUSTION CYCLE (SEMI DIESEL CYCLE) ENGINE f. *ACCORDING TO THE FUEL SUPPLY AND MIXTUREPREPARATION* - CARBURETTED TYPE (FUEL SUPPLIED THROUGH THE CARBURETTOR) - INJECTION TYPE (FUEL INJECTED INTO INLET PORTS OR INLET MANIFOLD) g. *ACCORDING TO THE NUMBER OF CYLINDER* - SINGLE CYLINDER - MULTI-CYLINDER ENGINE h. *METHOD OF COOLING* - WATER COOLED - AIR COOLED i. *SPEED OF THE ENGINE* - SLOW SPEED - MEDIUM SPEED - HIGH SPEED ENGINE j. *ARRAGEMENT OF CYLINDERS* - V- ENGINE - RADIAL ENGINE - INLINE ENGINE k. *METHOD OF CHARGING* - NATURALLY ASPIRATED ENGINE - SUPERCHARGED ENGINE.	Any 6 class = 6x1	6

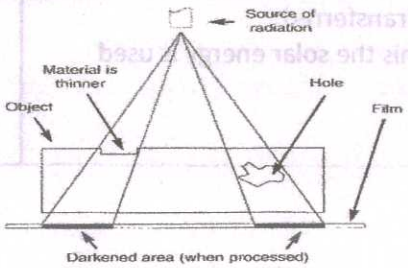
II(5)	During the upward motion, (from BDC to TDC) of the piston the air - fuel mixture enters the crank case through inlet port . At the same time, air-fuel mixture inside the cylinder is compressed. End of compression stroke, spark plug produces the spark air-fuel mixture starts burning. Due to combustion of fuel pressure inside the cylinder increases rapidly . The expansion of burned gases pushes the piston downwards. The stroke is power stroke. Nearly competing the expansion stroke, exhaust port uncovers and burned gases escapes. The transfer port is uncovered and the compressed air-fuelmixture in the crank case enters the cylinder. This completes one cycle and the process repeats.  (a) upward stroke	Exp = 3 Fig = 3	6
II(6)	**Classification** 1. On the basis of source of energy a) Conventional energy power plants. i. Steam power plant ii. Diesel power plant. iii. Hydroelectric power plant . iv. Nuclear power plant. v. Gas turbine power plant. b) Non - conventional energy power plants. i. Solar power plant. ii. Geothermal power plant. iii. Wind power plant. iv. Tidal power plant. v. Thermoelectric power plant. 2. On the basis of nature of load. a) Base load power plants. They having large capacity and continuous peration (working 5000 full power hour per year). eg. Hydro electric power plant, Nuclear power plant, Coal-fuel power plant etc. b.) Peak load power plant. They operated to meet the power demand at the time of maximum power consumption (working less than 2000 full power hour per year). eg. Diesel power plant, Gas turbine power plant etc. 3. On the basis of service condition. a) Stationary b) Mobile. 4. On the basis of location. a) Central power plant - Power plants located near the natural source of energy. eg. Coal – fuel steam power plant. b) Isolated power plant – Plant located away from the energy source and load centre.	4x 1.5=6	6

II(5)	This is used for to preheat the air supplied to the combustion chamber of a boiler,by using the heat in the waste flue gases. It is placed after the economiser and before the gases enter the chimeny.  Fig. (4.13) Air Preheater	Exp = 3 Fig = 3	6
II(6)	During the upward motion, (from BDC to TDC) of the piston the air - fuel mixture enters the crank case through inlet port . At the same time, air-fuel mixture inside the cylinder is compressed. End of compression stroke, spark plug produces the spark air-fuel mixture starts burning. Due to combustion of fuel pressure inside the cylinder increases rapidly . The expansion of burned gases pushes the piston downwards. The stroke is power stroke. Nearly competing the expansion stroke, exhaust port uncovers and burned gases escapes. The transfer port is uncovered and the compressed air-fuelmixture in the crank case enters the cylinder. This completes one cycle and the process repeats.  (a) upward stroke	Exp= 3 Fig=3	6
II(7)	**1. Flat plate solar collector** Solar radiation passes through a transparent plat and falls on the absorbing surface. The surface is made of black coated aluminum foil. The heat energy from solar radiation transferred to the fluid passing through the tube. In this the solar energy is used for heating purpose.		

II(7)	 Fig. (6.7) Flat plate solar collector **2. Parabolic collector** The solar radiation fall on the parabolic reflector surface is concentrated on its focus point. At the focus point an absorber ube fitted is transfer heat energy to the fluid which flowing through it.  Fig. (6.8) Parabolic solar collector	Exp=1 1/2 each, Fig= 1 1/2 each	6	5X6=30

PART C

Module I

III(a)	**RADIOGRAPHIC TEST** Radiographic test includes the use of X-rays and γ-rays in inspecting castings, forgings, welded joints etc. The test used to detect internal flaws like gas porosity in metal castings, cracks and slag inclusions in welded joints, etc which are otherwise difficult to detect. **Principle:** X rays and γ rays are passed through the metal being examined and is then allowed to impinge on sensitive film. The intensity of rays coming out of the object depend upon density of object. If an object has an internal defect, it will change the intensity of radiation passing through it, the defect will show up either white or dark area on the film. 	Exp= 4 Fig=3	7	

III(b)

Pig iron is manufactured chemical reduction of iron ore in a blast furnace. The process of reduction of iron ore in to pig iron is known as **Smelting.** The furnace in which smelting process taking place is known as **Blast furnace**

They have thick steel sides, lined with refractory bricks, to ensure that heat is not lost. Blast furnaces are used continuously and are only shut down when their brick lining needs replacing.

Different process taking place in blast furnace

1. Introduction of charge: Charge is introduced in the top of furnace by cup and cone arrangement.
2. Introduction of hot blast: A hot blast of air is introduced in to the furnace through tuyeres.
3. Combustion of coke: Coke present in the charge burns in the hot air producing carbon dioxide and generate more heat

$$C+O_2=CO_2+\Delta(heat)$$

4. Production of Carbon monoxide(Reducing agent): The carbon dioxide formed rises up and react with incoming coke forming carbon monoxide

$$CO_2+C=2CO$$

5. Reduction of hematite: Carbon monoxide formed is a powerful reducing agent . It reduce hematite to Iron

$$Fe_2O_3+3CO=2Fe+3Co_2$$

Exp= 4
Fig=4

8

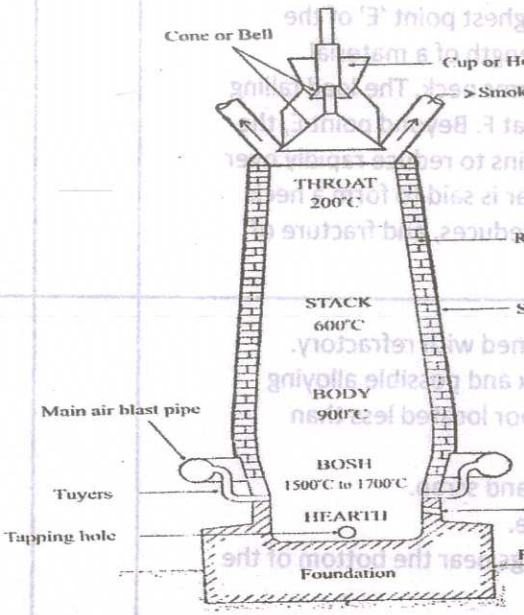
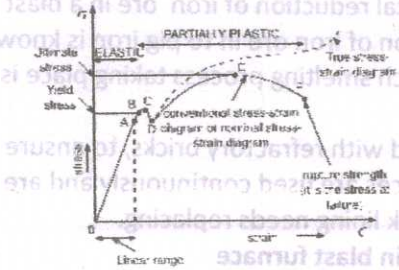


Fig. (3.1) Blast Furnace

7+8=15

IV(a)	 **SALIENT POINTS OF THE GRAPH:** **A** - So it is evident form the graph that the stress is proportional to strain giving a st.line relationship. This law of proportionality is valid upto a point A. This point is known as **the limit of proportionality or the proportionality limit.** **B** - For a short period beyond the point A, the material may still be elastic in the sense that the deformations are completely recovered when the load is removed. The limiting point B is termed as **Elastic Limit** . **(C) and (D)** - Beyond the elastic limit plastic deformation occurs and strains are not totally recoverable. There will be thus permanent deformation when load is removed. These two points are termed as upper and lower yield points respectivel The stress at the yield point is called the yield strength. **(E) –(F)** : Further increase in the load will cause marked deformation in the whole volume of the metal. The maximum load which the specimen can with stand without failure is called the load at the ultimate strength . The highest point 'E' of the diagram corresponds to the ultimate strength of a material. **(F)** - Beyond point E, the bar begins to forms neck. The load falling from the maximum until fracture occurs at F. Beyond point E, the cross-sectional area of the specimen begins to reduce rapidly over a relatively small length of bar and the bar is said to form a neck. This necking takes place whilst the load reduces, and fracture of the bar finally occurs at point F.	Exp= 4 Fig=3	7	
IV(b)	- It consists of a large shell of steel plate lined with refractory. - The charge, consisting of iron, Coke, flux and possible alloying elements, is loaded through a charging door located less than halfway up the height of the cupola. - The iron is usually a mixture of pig iron and scrap. - Coke is the fuel used to heat the furnace. - Forced air is introduced through openings near the bottom of the shell for combustion of the coke. - The iron is usually a mixture of pig iron and scrap - Coke is the fuel used to heat the furnace. - Forced air is introduced through openings near the bottom of the shell for combustion of the coke. - The flux is a basic compound such as limestone that reacts with coke ash and other impurities to form slag. The slag serves to cover the melt, protecting it from reaction with the environment inside the cupola and reducing heat loss. - As the mixture is heated and melting of the iron occurs, the furnace is periodically tapped to provide liquid metal for the pour.	Exp= 4 Fig=4	8	

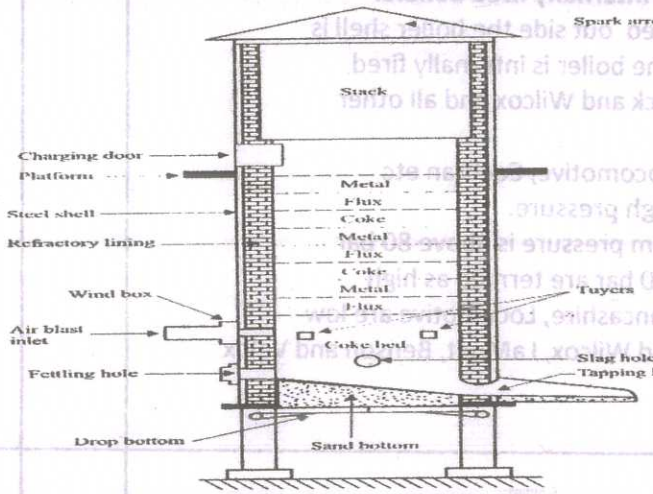


Fig. (3.2) Cupola furnace

7+8=15

Module II

V(a)

CLASSIFICATION OF BOILERS

Boiler classification is based on various criteria.

1. Fire tube boilers and water tube boilers.

In fire tube boilers, the flue gases pass through a number of tubes and water surrounded it.

eg. Cochran boiler, Lancashire boiler, Locomotive boiler,

In water tube boilers, water flows through a number of tubes and flue gases surrounded it.

eg. Babcock and Wilcox boiler, Lamont boiler, Benson boiler.

2. Natural circulation boilers and forced circulation boilers.

In natural circulation boiler, water in the boiler is circulated by natural convection current due to heating.

eg. All low pressure boilers such as Cochran boiler, Lancashire boiler, Babcock and Wilcox boiler.

In forced circulation type, pumps are used to circulate water.

eg. All high pressure water tube boilers such as Lamont boiler, Benson boiler, Velox, loeffler etc.

6 point =6 eg. 7 =1

3. Horizontal boilers and vertical boilers.

Based on the direction of axis of boiler shell.

Horizontal type: Locomotive, Lancashire, Babcock and Wilcox etc.

Vertical type : Cochran, Lamont, Benson etc.

4. Stationary boilers and Mobile boilers.

Stationary boilers are used in power plants and industries.

Mobile boilers are move from one place to the other like Locomotive and marine boilers.

5. Externally fired boilers and internally fired boilers.

Position of furnace is placed out side the boiler shell is externally fired, if it is inside the boiler is internally fired

Eg. For externally fired: Babcock and Wilcox and all other water tube boilers.

Internally fired: Lancashire, Locomotive, Cochran etc

6. Low pressure boiler and high pressure.

Boilers which produces steam pressure is above 80 bar is low pressure and above 80 bar are termed as high pressure boilers Cochran, Lancashire, Locomotive are low pressure boilers. Babcock and Wilcox, LaMont, Benson and Velox are high pressure boilers.

V(b)

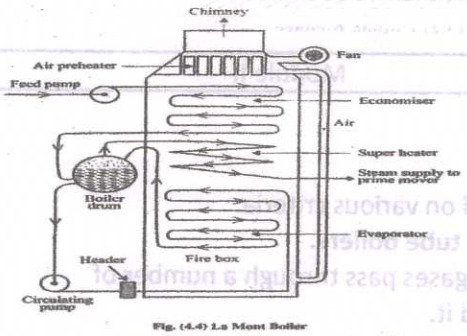


Fig. (4.4) La Mont Boiler

Working

- the feed pump circulates the water in the economiser.
- The economiser heats the water to some degree.
- From economiser, water enters into steam separating drum.
- From steam separating drum the mixture of water and steam is forced circulated through the radiant evaporator by an external centrifugal pump.
- Radiant evaporator heats the water and changes it into steam.
- Form radiant evaporator the water-steam mixture passes through the convective evaporator.
- Here the temperature of the fluid increase and most the water gets converted into saturated steam.
- And after that the saturated steam enters into the steam separator drum.
- The steam separator drum as names indicates separates the steam from water.
- The steam gets collected at the upper portion of the drum.
- From steam separator drum, steam passes through the superheater.
- The super heater increases the temperature of the steam to the desired level.
- Finally the superheated steam is either transfer to the steam collecting drum or made to strike on the blades of the turbine.
- The working pressure, temperature and capacity of this boiler is 170 bar, 773 K and 50 tonnes/h.

Exp= 4
Fig=4
8

7+8=15

VI(a)

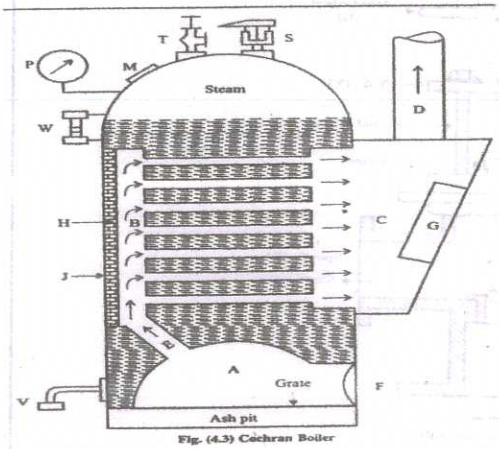


Fig. (4.3) Cochran Boiler

A - Furnace	F - Fire door	P - Pressure gauge
B - Combustion Chamber	G - Smoke box door	S - Safety valve
C - Smoke box	H - Fire brick lining	T - Steam stop valve
D - Chimney	J - Boiler shell	V - Blow-off cock
E - Short pipe	M - Man hole	W - Water level indicator

Working

(i) Path of Flue gas:

- The hot flue gases from the furnace rise up and enter through the small flue pipe into the combustion chamber.
- There after the hot flue gases pass through the horizontal fire tubes and the smoke box before finally discharged to the atmosphere through the chimney.
- The passage of flue gases through fire box to the chimney give its heat to the surrounding water to generate steam.

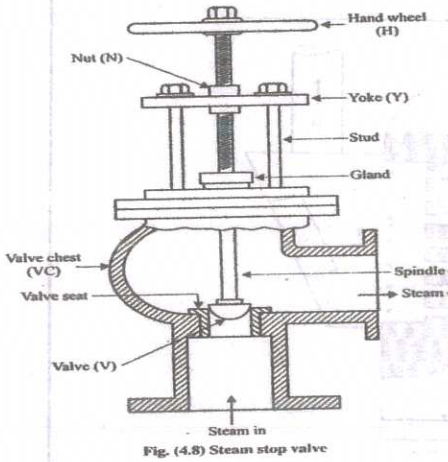
Fig = 3
Exp=4
7

(ii) Path of steam flow:

- The feed water is supplied uniformly by a feed check valve.
- When the boiler is heated, the cold water in the shell courses down and hot water rises up between the fire tubes by natural circulation.
- The steam collected in the steam space then passes through pipe where steam is required.

(iii) Draft system:

- In this the draft is produced by natural circulation of air and gas usually done naturally with the help of

VI(b)	 Fig. (4.8) Steam stop valve **Function:** - The function of the steam stop valve or junction valve is to stop or regulate the flow of steam from the boiler to the steam pipe or from one steam pipe to another steam pipe or from the steam pipe to the turbine/engine. **Location:** - This valve is usually mounted over the boiler drum or in the steam pipe leading to-the steam turbine/engine.	Fig = 4 Exp=4	8	7+8=15
	Module III			
VII(a)	**1. Cylinder.** - made of iron or aluminium alloy. - enough space and guide the path of piston movement. - it must be capable of withstand high temperature and pressure due to the combustion of fuel inside the cylinder. - water jackets are provided out side surface for cooling to prevent the over heating of cylinder. - spark plug , inlet valve and exhaust valve are fitted on cylinder head. **2. Piston.** - a reciprocating part of IC engine which moves inside the cylinder. - made of cast iron or aluminium alloy. - heat energy produced by the combustion of fuel is converted into mechanical energy with the help of piston. **3. Piston rings.** - rings are fitted into the circumferential grooves of the piston. Functions: i. to minimise the gap between the inner surface of the cylinder and piston. ii. to prevent wear and tear of the piston. iii. To provide better lubrication.			

VII(a)

4. Gudgeon pin.

- connects the connecting rod with the piston.

5. Connecting rod.

- made of steel which connects the piston and crank shaft through crank arm.

6. Crank shaft and crank pin.

- the crank shaft converts reciprocating motion of the piston into rotary motion.
- crank pin helps to connect the crank arm and connecting rod.

7. Fly wheel.

- a heavy mass is connected to the crank shaft.
- to maintain uniform speed of the engine.
- helps to smoothen the variation in the engine.

8. Valves and Cam mechanism.

- valves controls the intake of air, air fuel mixture (for SI engines) and exhaust of the combustion gases.
- cam mechanism is used to operate the valves, mechanism of a

Any 3 =3, Fig= 4 — 7

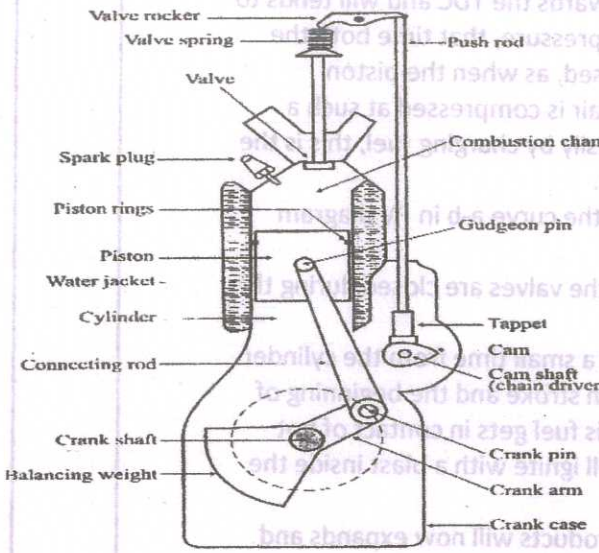
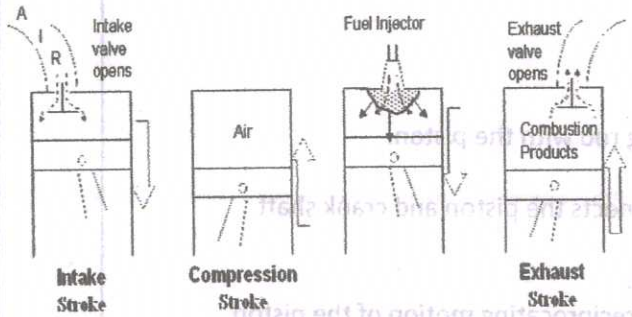


Fig. (5.1) Cross section of spark ignition IC engine

VII(b)



Working of four stroke diesel engine.

One power stroke is obtained by two complete revolution of the crank shaft. The process is completed by 4 strokes.

1. Suction Stroke
2. Compression Stroke
3. Power Stroke
4. Exhaust Stroke

Suction Stroke

- In the Suction Stroke the initial position of the Piston is at the TDC.
- Piston will starts to move from TDC to BDC the inlet valve will be opened and the air is sucked inside the cylinder, the valve remains open as the piston will reach to the BDC.

Compression stroke

- In the Compression Stroke, the Piston is at the BDC so it will start moving upwards towards the TDC and will tends to compress the air at very high pressure, that time both the inlet and outlet valves are closed, as when the piston reaches nearly at the TDC the air is compressed at such a high pressure get ignited very easily by charging fuel, this is the completion of the second stroke.
- The process is represented by the curve a-b in PV diagram

Expansion stroke

- In the Expansion stroke, both the valves are closed during the complete stroke.
- Fuel is charged with nozzle for a small time from the cylinder head at the end of compression stroke and the beginning of the expansion stroke, when this fuel gets in contact of hot red highly compressed air it will ignite with a blast inside the cylinder at constant pressure.
- Due to this blast the ignited products will now expands and tends to move the piston in the downward direction towards the BDC. This is the completion of the third stroke of piston.

Exhaust Stroke

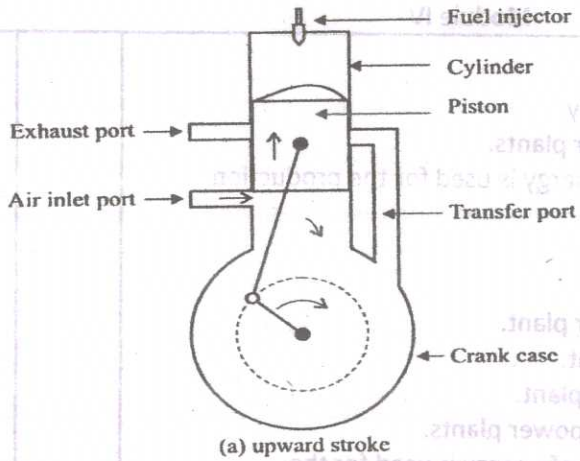
- In the Exhaust Stroke, the piston now moves from the BDC to the TDC and the outlet valve is opened at the same time the

Fig= 4
Exp=4

8

7+8=15

VIII(a)



(a) upward stroke

Working

- Fig shows the simplest form of a two-stroke engine
- The cylinder is connected to the closed crank chamber.
- Instead of valves they use the ports (inlet, exhaust and transfer port) to entry of air and removal exhaust gases.
- During the upward motion, (from BDC to TDC) of the piston the fresh air enters the crank case through inlet port . At the same time, air inside the cylinder is compressed.
- End of compression stroke, fuel is sprayed by the fuel injector into the compressed air and fuel starts burning.
- Due to combustion of fuel pressure inside the cylinder increases rapidly .
- The expansion of burned gases pushes the piston downwards. The stroke is power stroke.
- Nearly competing the expansion stroke, exhaust port uncovers and burned gases escapes.
- The transfer port is uncovered and the compressed air in the crank case enters the cylinder.
- This completes one cycle and the process repeats.

Fig=3
Exp=4

7

VIII(b)

Comparison of S.I and C.I engines

S.I Engine	C.I Engine
1. Working based on otto cycle	1. Working based on diesel cycle
2. Spark plug is used	2. Fuel injector is used
3. Fuel-air mixture is taken in, during suction stroke	3. Only fresh air is taken in, during suction stroke
4. Fuel used is petrol or gasoline	4. Fuel used is diesel.
5. Light weight	5. Heavy weight
6. Lower compression ratio (6-10)	6. Higher compression ratio (16-20)
7. High speed engine	7. Low speed engine
8. Maximum efficiency is lower	8. Maximum efficiency is higher
9. Throttle controls the quantity of air-fuel mixture to regulate the load	9. Quantity of fuel is regulated to control the load. Air quantity is not varied.

Any 8 points
8*1=8

8

7+8=15

Module IV

IX(a)

Classification

1. On the basis of source of energy
   a) Conventional energy power plants.
      Conventional source of energy is used for the production of electric power.
      i. Steam power plant
      ii. Diesel power plant.
      iii. Hydroelectric power plant.
      iv. Nuclear power plant.
      v. Gas turbine power plant.
   b) Non - conventional energy power plants.
      Non- Conventional source of energy is used for the production of electric power.
      i. Solar power plant.
      ii. Geothermal power plant.
      iii. Wind power plant.
      iv. Tidal power plant.
      v. Thermoelectric power plant.

7

2. On the basis of nature of load.
   a) Base load power plants.
      They having large capacity and continuous operation (working 5000 full power hour per year).
      eg. Hydro electric power plant, Nuclear power plant, Coal-fuel power plant etc.
   b.) Peak load power plant.
      They operated to meet the power demand at the time of maximum power consumption (working less than 2000 full power hour per year).
      eg. Diesel power plant, Gas turbine power plant etc.

4*1.5= 6, Ex=1

3. On the basis of service condition.
   a) Stationary
   b) Mobile.
4. On the basis of location.
   a) Central power plant - Power plants located near the natural source of energy.
      eg. Coal – fuel steam power plant.
   b) Isolated power plant – Plant located away from the energy source and load center.

IX(b)

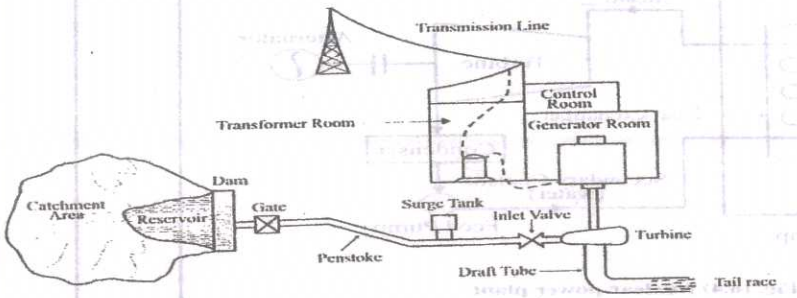


Fig. (6.2) Schematic diagram of a hydro electric power plant

Working

- A hydroelectric power plant converts of hydraulic energy into electrical energy.
- It needs huge amount of water at sufficient head all the time. So a hydroelectric dam is constructed across the river or lake.an artificial storage reservoir where water is stored, is placed back side of the dam. This reservoir creates sufficient
- A pressure tunnel is placed in between the reservoir to valve house and water is coming from reservoir to penstock via this tunnel.
- An automatic controlling sluice valve is placed in valve house and it controls water flow to the power station and the latter cuts off supply of water in case the penstock bursts.

Fig=4, Exp=4 — 8

- Penstock is a huge steel pipe in which water is taken from valve house to turbine. A surge tank is also provided just before the valve house for better regulation of water pressure in the system.
- Now water turbine converts hydraulic energy into mechanical energy and an alternator which is couple to the water turbine converts this mechanical energy into electrical energy

7+8=15

X(a)

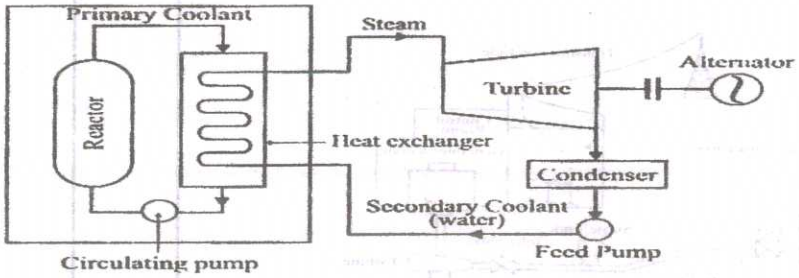


Fig. (6.4) Nuclear power plant

Fig=3
Exp=4

7

-In a nuclear power plant, heat energy is generated by a nuclear reaction called as **nuclear fission**. Nuclear fission of heavy elements such as Uranium or Thorium is carried out in a special apparatus called as a **nuclear reactor**.

- A large amount of heat energy is generated due to nuclear fission.
- This heat energy is utilized for convert the water to steam.
- This high pressure and high temperature steam is fed to the steam turbine.
- the steam expanded in the turbine is converted the heat energy into mechanical energy of the turbine shaft.
- The turbine shaft is coupled with generator to rotate and produce electrical energy.

X(b)

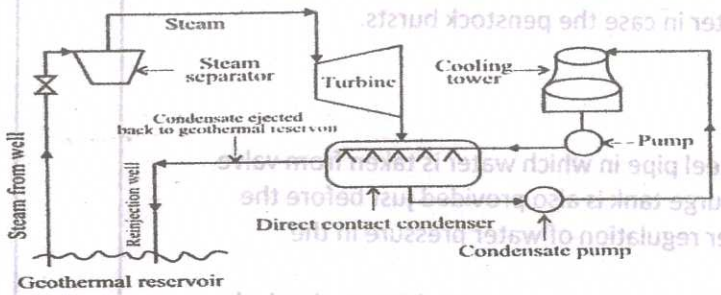


Fig. (6.13) Geothermal power plant

Fig=4,
Exp=4

8

Working

- The energy from the geothermal resources are extracted by drilling wells that connects the fissures (cracks).
- Steam is extracted through these wells and the temperature from 250°C to 300°C.
- Steam extracted from the well is passed through steam seperator for to remove corrosive gases and impurities.
- The pure steam flow through the turbine thus producing mechanical energy.
- The turbine is coupled to generator and power is produced

7+8=15