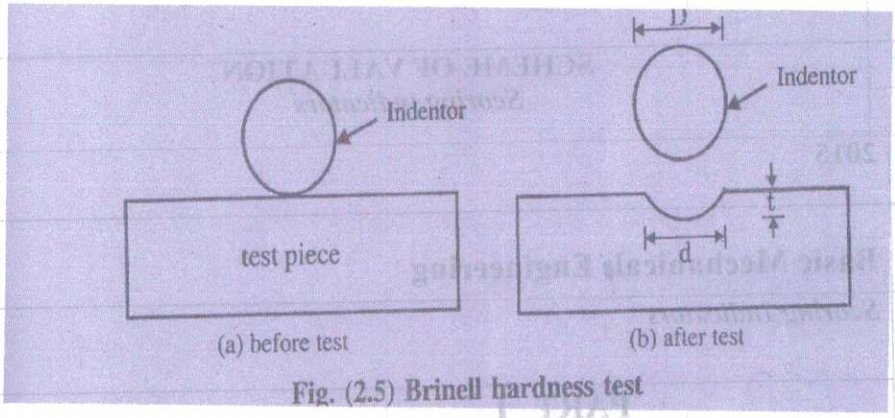
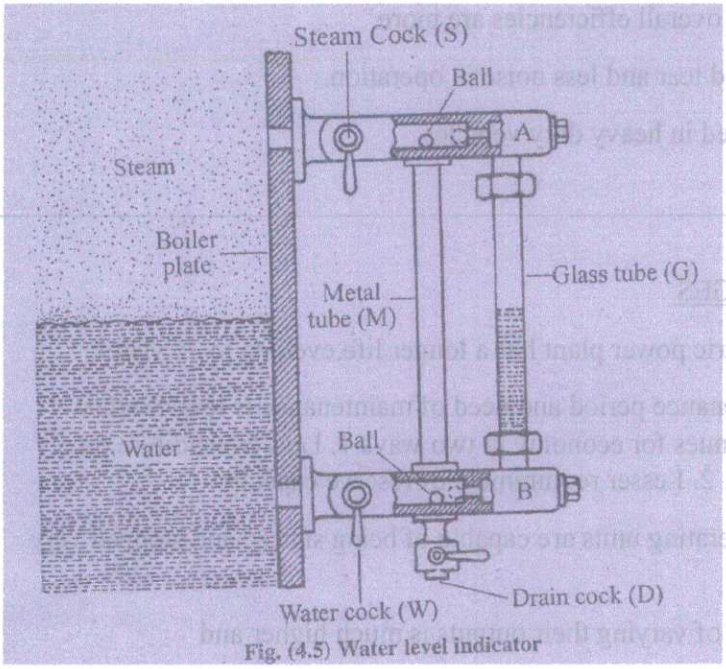
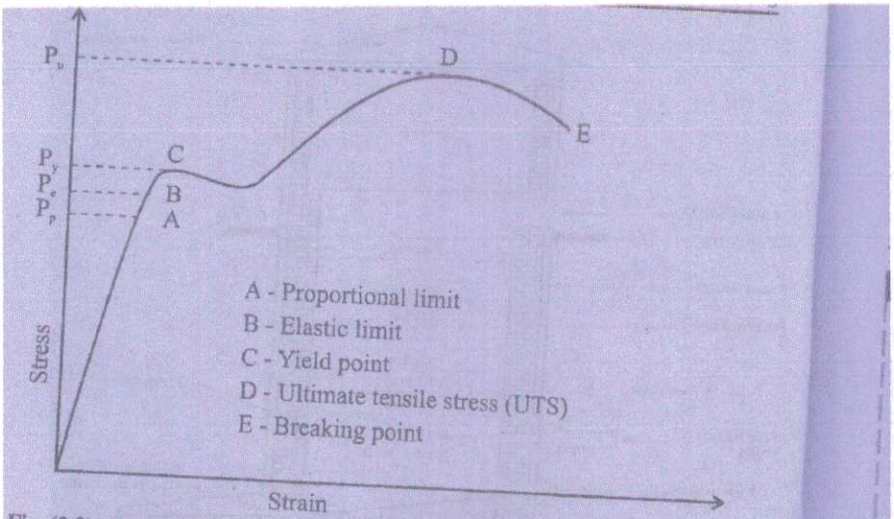
SCHEME OF VALUATION
Scoring indicators

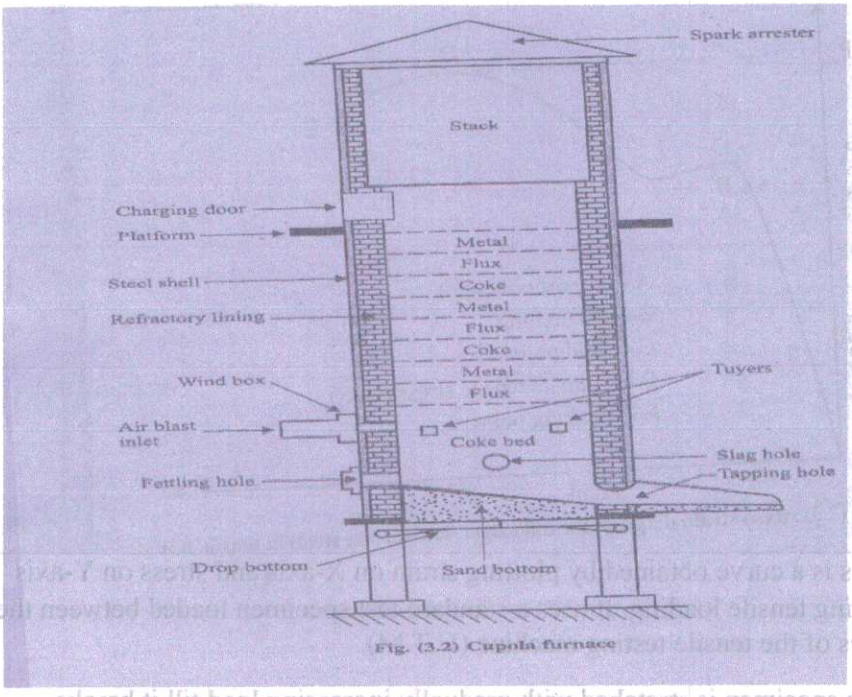
Revision		**2015**	**Course Code**		**2021**
Course title		**Basic Mechanical Engineering**	Spit Up Score	sub total	Total
Question No		***Scoring Indicators***			
		PART I			
I	1	It is defined as the ability of material to withstand cyclic or fluctuating stresses. The maximum stress below which material will operate indefinitely is called endurance limit or fatigue limit.	2	2	10
	2	Industrial food processing, power generation, chemical industries, sugar factories, drive locomotives and ships.	0.5*4	2	
	3	To prevent pressure leakage through the gap between piston and cylinder; To scrap oil in the cylinder walls.	0.5*4	2	
	4	It is a process of expelling burned gasses in the cylinder by inflow fresh charges in twostrock engines.	2	2 2	
	5	PU^{239}(PIUTONIUM),U^{238}(URANIUM),TH^{232}(THORIUM).	.5*4		
		PART II			
II	1	Strength: It is the ability of material to withstand the load without fail. Stiffness: It is the ability of material to resist elastic deformation under loading. Elasticity: It is the ability of material to return to its original shape after removal of the load. Ductility: it is the ability of material to undergo considerable plastic deformation before fracture under tensile load. Malleability: It is the ability of the material to undergo plastic deformation under compressive load is called malleability. Toughness: It is the ability of the material to absorb the energy in plastic range. Brittleness: It is the ability of the material to fracture without appreciable deformation.	6×1	6	30

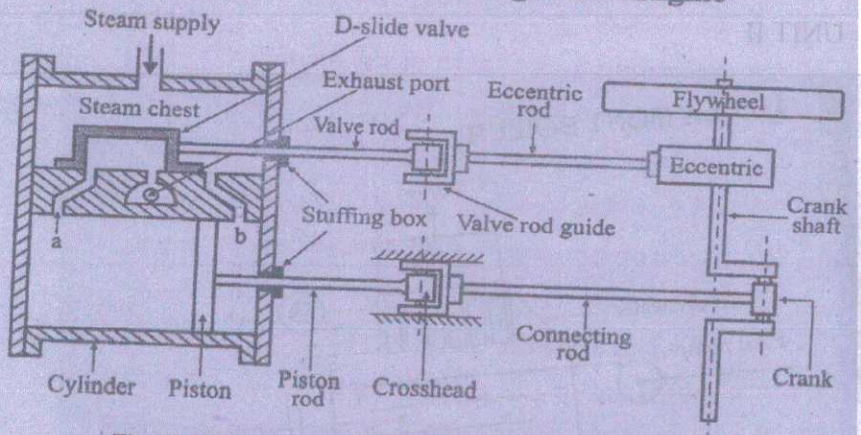
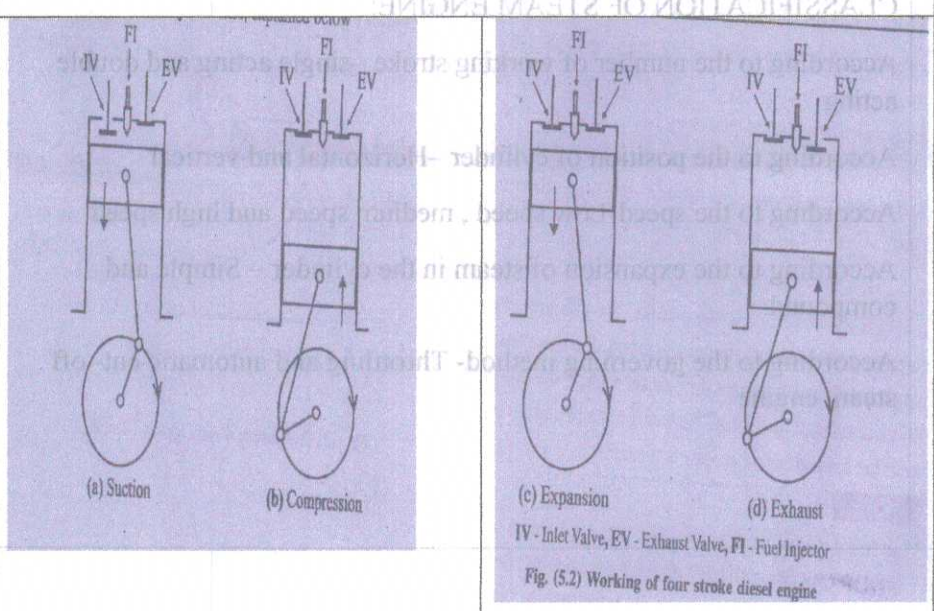
	2	 Fig. (2.5) Brinell hardness test It is a method of testing hardness of material by indention method. In this test hardened steel ball of diameter 10mm is forced into the surface for 15-30 seconds with a suitable load to get indentation. The measurement of hardness number is obtained by BHN=Load applied in kg/ curved surface area of indentation in (mm2) $= 2P/\pi D\,[D-\sqrt{(D^2-d^2)}]$ Where D=diameter of steel ball in mm d =diameter of indention in mm P =applied load in kg.	3+2	6	
	3	Fire tube boiler.... •Hot gases flow through (inside) the tubes and water is surrounded the tubes. •Furnace inside the boiler shell •It is bigger in size and requires more floor area •Slow evaporation •Cooperating pressure range is from 15-25 bar Low efficiency max 80% Large water content and low steam generation provides more safety. Water tube boiler.. Water flows through the tubes and surrounded by hot gases. Furnace outside the boiler shell. It is smaller in size and requires less floor area. Rapid evaporation.	3+3	6	

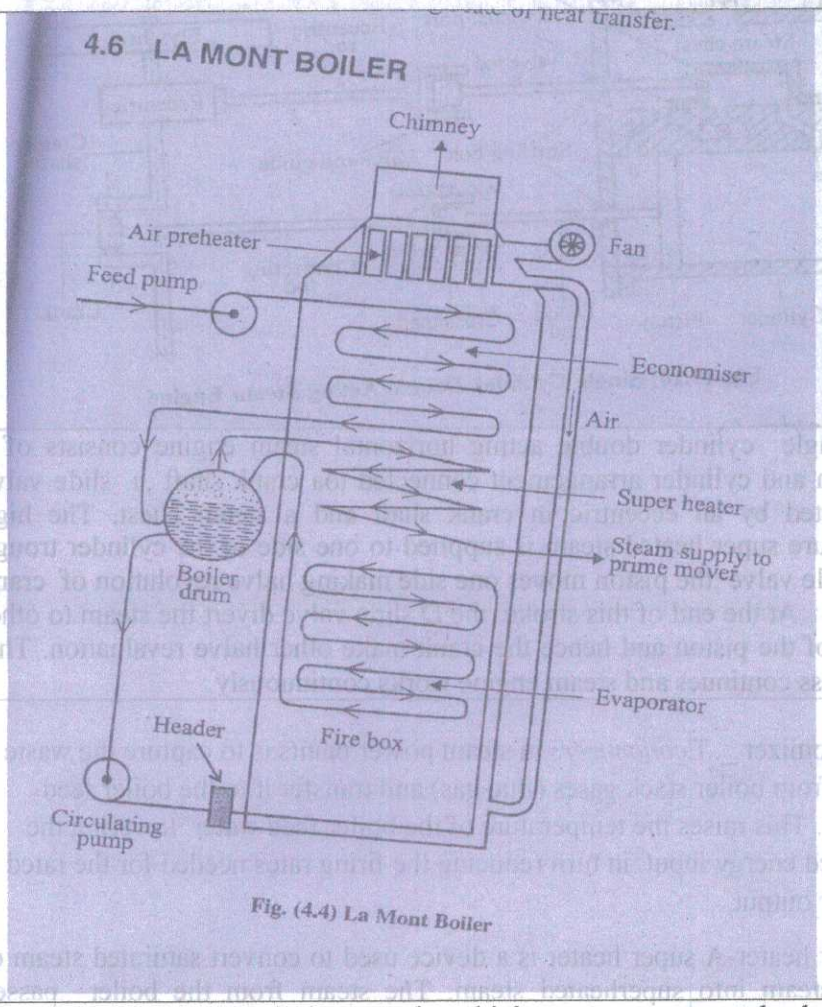
	4	 Fig. (4.5) Water level indicator The water level indicator is used to know the water level inside the boiler. It is a safety device for correct working of the boiler. There are two indicators for any boilers and it is fitted infront of the boiler. It consist of three cocks and a glass tube. Steam cock keeps the glass tube in connection with steam space. Water cock puts the glass tube in connection with water. Drain cock is used at frequent intervals to keep the water and steam cocks clear.	3+2	6
	5	. 2 STROKE ENGINES Ports are required instead of valves. Ports are operated by piston. The charge first enters into the closed crank case. All events will be completed in two strokes of the engine. Thermal and overall efficiency are less. More wear and tear and more noise in operation Uniform torque is produced so requires lite fly wheel. Generally used in light duty vehicles. 4 STROCK ENGINES Requires valves. To operate valves cams, camshafts, levers and rocker arm are required. The charge directly enters into the engine cylinder. All events of the engine will be completed in 4-strokes of the engine. Torque is not uniform and requires heavier fly wheel.	6	6

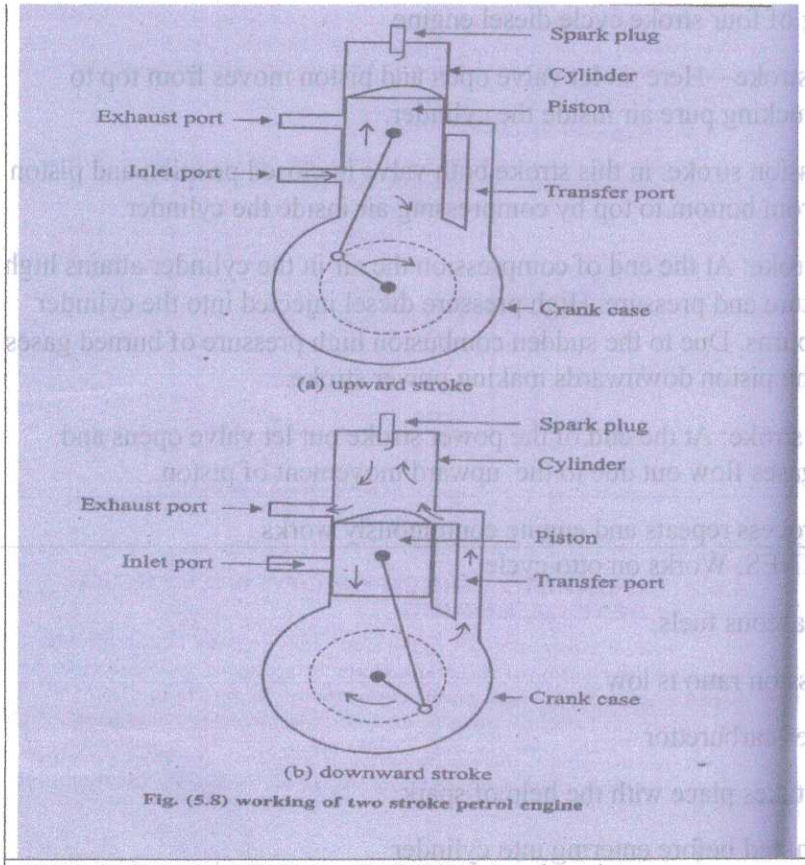
		Thermal and overall efficiencies are more. Less wear and tear and less noise in operation. Generally used in heavy duty vehicles			
	6	ADVANTAGES. *Hydro electric power plant has a longer life,even up to 35 years. * The maintenance period and need of maintenance is less. So this provides avenues for economy in two ways 1. Less expenditure on maintenance. 2. Lesser requirement of reserve capacity. * Hydro generating units are capable of being started and stopped very quickly. * The ability of varying their outputs is much higher and *The electrical characteristics of hydro plants are more favourable from the view point of lending strength to the power system. * It permits fuel burning plant to operate in the best way that may be required for them. * Hydro plant is better suited for peaking duties.	6x1	6	
	7	ADVANTAGES • Renewable source of energy. • No pollution • Cost of energy is very less • Less maintenance. • Can be installed even at remote places. DISADVANTAGES • Very less suitable capacity power generation. • Only available at day time. • Large space required for effective utilisation of sunlight.	3+3	6	
		Part C			

III	a	 Fig. (2.3) stress-strain diagram for mild steel (low carbon steel) in tensile test	5	8	15
		This is a curve obtained by plotting strain on X-axis and stress on Y-axis during tensile loading. It uses a standard test specimen loaded between the jaws of the tensile testing machine (U.T.M). The specimen is stretched with gradually increasing load till it breaks. The various salient points are: PROPORTIONAL LIMIT: Maximum stress at which stress is directly proportional to strain. ELASTIC LIMIT: Maximum stress that the material can withstand without any permanent deformation. YIELD POINT: Point at which the strain increases with\ out increasing stress. ULTIMATE STRESS: Maximum stress that a material can withstand without fracture. BREAKING STRENGTH: It is a strength at which material fracture is less than the ultimate strength.	3		
	b	WHITE CASTE IRON: In white caste iron carbon in bonded form (Fe3C) contains 2-3 percent carbon. It is very hard and non machine able used for rollers, break shoes etc. GREY CASTE IRON: In this caste iron carbon is in free form (graphite) and in grey colour. It process excellent compressive strength and machine ability hence it is used for machine beds, pipes, agricultural implements, engine block MALLEABLE CASTE IRON: Heat treated with caste iron is called malleable caste iron. Processes good machine ability and caste ability used for automobile parts gears etc. NODULAR CASTE IRON: Here carbon present in the form of balls or steroids and process high strength and toughness. It is used for agricultural and automobile parts. CHILLED CASTE IRON: It is a controlled heat treated caste iron processes very hard surface with tough core these are used for railway wheels, sprockets and machine parts.		7	

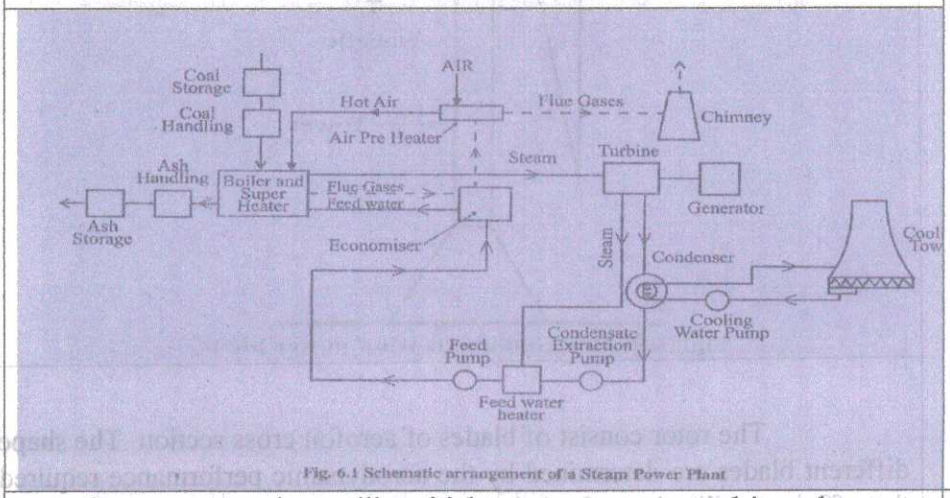
IV	a	 Fig. (3.2) Cupola furnace	5	8	15.
		CUPOLA FURNACE: Cupula furnace is used for production of caste iron by purifying pig iron. The main impurities present in the pig iron are carbon, silicon, manganese, sulphur and phosphorous reduced its percentage by oxidising these impurities in the furnace It is a 2-3 metre 6-8 meter height cylinder lined with refractory material. The charge like coke, limestone, pig iron, iron scrap are put into the furnace layer by layer. During the combustion all impurities oxidises and caste iron is taken out from the tap hole.	3		
	b	ALLUMINIUM ALLOYS: Aluminium is a light. High electrical and thermal conductivity, corrosion resistant metal used for manufacture of engine and other automobile parts. Aluminium alloyed with small percentage of metals like copper, magnesium, iron to enhance its properties Duralumin –contains CU, Mg, Mn, Fe having good machine ability and strength used for parts like tubes, bars,sheet etc. CASTEALLOY; Caste alloy containing Cu, Fe and Si processes good machine ability and caste ability used for marine and ornamental applications. Y-ALLOY: contain Cu, Ni, Mg processes high strength at elevated temperature used for making engine parts. HINDALIUM- Is a aluminium and magnesium corrosion resistant alloy used for diary and food handling equipment. COPPER ALLOY: Copper with zinc ,tin, manganese etc are added to get enhanced properties. BRASS- An alloy of copper and zinc. According to the composition of zinc different brasses with varied properties are obtained Eg: Yellow brass (25%) zinc , Cartidge brass (30%) zinc etc. Bronzes are alloy of copper and tin with a small percentage of other impurities are used for springs , bearings etc. According to the percentage of tin these are available in different names like bell metal, gun metal etc.		7	

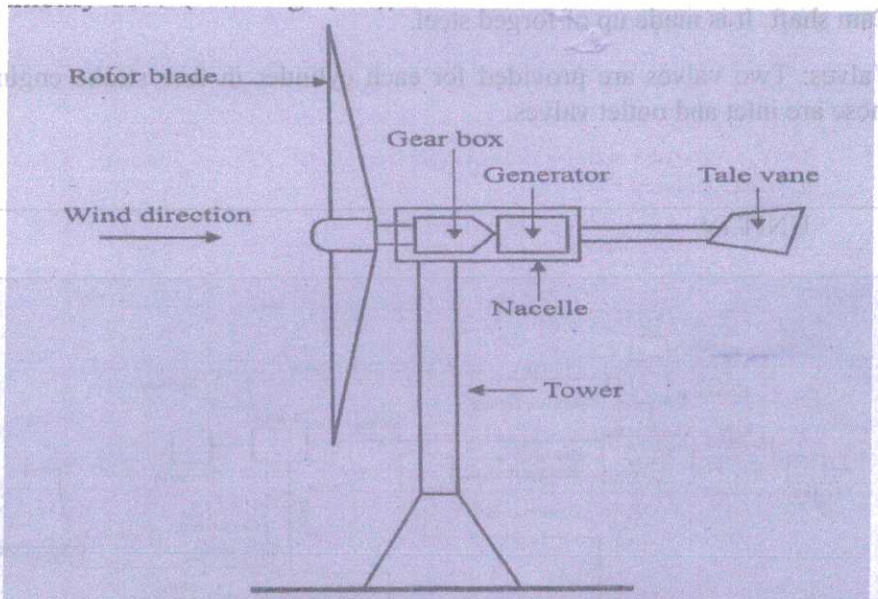
VI	a	**4.10.2 Single Cylinder Double Acting Steam Engine**  **Fig. (4.16) Single Cylinder Double Acting Steam Engine**	5	8	15
		A single cylinder double acting horizontal steam engine consists of a piston and cylinder arrangement connected toa crank shaft ,a slide valve operated by an eccentric in crank shaft and a steam chest. The high pressure super heated steam is supplied to one side of the cylinder trough D slide valve ,the piston moves one side making halve revolution of crank shaft . At the end of this stroke the D slide valve divert the steam to other side of the piston and hence the crank make other halve revaluation. This process continues and steam engine works continuously	3		
	b	Economizer _. *Economizers* in steam power plants is to capture the waste heat from boiler stack gases (flue gas) and transfer it to the boiler feed water. This raises the temperature of the boiler feed water, lowering the needed energy input, in turn reducing the firing rates needed for the rated boiler output. Super heater-A super heater is a device used to convert saturated steam or wet steam into superheated steam. The steam from the boiler passed through small pipe located just over the fire to absorbs heat and get high pressure high temperature steam.	7 3.5+ 3.5	7	
		UNIT III			
VII	a	 IV - Inlet Valve, EV - Exhaust Valve, FI - Fuel Injector **Fig. (5.2) Working of four stroke diesel engine**	4	8	15

		UNIT II			
.V	a	4.6 LA MONT BOILER  Fig. (4.4) La Mont Boiler	5	8	15
		LA-MONT BOLER- It is a modern high pressure water tube boiler. It consist of a circulating high pressure pump driven by small steam turbine, a water drum, air pre- heater , economiser, evaporator and super heater water from the hot well is pumped into the boiler and high pressure steam is taken out through the super heater	3		
	b	CLASSIFICATION OF STEAM ENGINE: According to the number of working stroke –single acting and double acting According to the position of cylinder –Horizontal and vertical According to the speed-Low speed , medium speed and high speed. According to the expansion of steam in the cylinder – Simple and compound. According to the governing method- Throttling and automatic cut- off steam engine		7	

VIII	a	 Fig. (5.8) working of two stroke petrol engine	5	8	15
		TWO STROKE PETROL ENGINE: As the piston moves upwards it un covers the inlet port and the air-fuel mixture enters the crankcase. At the same time the air-fuel mixture present inside the cylinder is compressed. At the end of compression, spark plug is activated and spark is produced inside the cylinder. The air-fuel mixture is ignited and combustion takes place. The burned gas starts expanding and pushes the piston downward. Thus power stroke takes place. During this expansion process, the piston covers the inlet port and uncovers the exhaust port. The burnt gas escapes through the exhaust port. Then the transfer port is uncovered and the compressed air-fuel mixture from the crank case flows into the cylinder. The whole process is completed with two stroke of the piston.	3		
	b	IC ENGINE Piston- Made of aluminium alloy. Cylinder: Made of caste iron. Cylinder block: This is the main body of the engine. Cylinder head: Made of caste iron Piston rings :These are made with special caste iron with Chrome planting Connecting Rod It is made with medium carbon steel. Gudgeon pin: Made with steel. Crank pin: It connects big end of connecting rod to crank shaft. Crank shaft: it is made up of forged steel.	7 (any 7)	7	

		Working of four stroke cycle diesel engine Suction stroke—Here in let valve open and piston moves from top to bottom sucking pure air inside the cylinder. Compression stroke: in this stroke both valve in closed position and piston moves from bottom to top by compressing air inside the cylinder. Power stroke: At the end of compression the air in the cylinder attains high temperature and pressure. High pressure diesel injected into the cylinder and get burns. Due to the sudden combusion high pressure of burned gases pushes the piston downwards making power stroke. Exhaust stroke: At the end of the power stroke out let valve opens and burned gases flow out due to the upward movement of piston. These process repeats and engine continuously works	4		
	b	SI ENGINES: Works on otto cycle Petrol, gaseous fuels Compression ratio is low It requires carburettor Ignition takes place with the help of spark Fuel is mixed before entering into cylinder. Low thermal efficiency. Less weight. The initial cost is low. Running cost is high. Vibration of engine is low, suitable for cars and two wheelers. CI ENGINES: Works on diesel cycle. Diesel and heavy oils. Compression ratio is high. It requires fuel injector. Fuel is sent into the cylinder at the end of compression. High thermal efficiency. More weight. The initial cost is high. Running cost is low. High vibration suitable for heavy vehicles such as buses trucks etc.	7 3.5+ 3.5		7

		Cam shaft: It is made up of forged steel. Valves: Two valves are provided for each cylinder in four stroke engine these are inlet and outlet valves.			
IX	a	UNIT IV	5	8	15
		 Fig. 6.1 Schematic arrangement of a Steam Power Plant			
		Steam power plant utilises high pressure steam to drive the steam turbine and out put mechanical energy is given to generator to produce electricity. The coal is burned in the furnace and this heat is used to produce steam inside the boiler shell. Various systems like economizer, super heater, air pre heater ,condenser, cooling towers ,feed water heater, coal chargers etc are provided for smooth functioning of the power plant.	3		
	b	According to capacity of water flow regulation. ex.1. run of river plants. 2. storage plant and pumped storage plant. According to head under witch they work.. low, medium, and high head plants, According to the basis of operation loads. applied load and automatic applied load plants Classification based on plant capacity. micro hydrel plant ,medium capacity plants, high capacity plants, super plants. Classification based on storage and poundage. storage reservoir plants., on-storage Classification based on location and topography. low head plants, hilly area plants,mountaineous region plants. Classification according to turbine characteristics. high specific speed., medium specific speed, low specific speed		7	

X	a.	 Fig. (6.9) Horizontal axis wind power plant	3	8	15
		The rotor consist of blades of aerofoil cross section .The shapes of different blades are determined by the aerodynamic performance required for the efficient utilisation of wind energy. The blades are commonly made of wood or aluminium. The blades are attaching to the main rotating shaft by means of hub assembly. The kinetic energy of the wind causes the rotor blade to rotate. A step up gear is used for boosting the low speed of the rotator to the required high speed. The high speed shaft from the gear assembly is attached to the generator and electricity is produced The casing that protects the generator and the gear assembly is called nacelle. The tail vane helps to maintain proper orientation of the windmill with respect to the direction of wind. ADVANTAGES: Wind energy is inexhaustible. These power plants are echo friendly. DISADVANTAGES Wind power is not consistent and steady. Cost per unit power production is high.	3 + 2		
	b	Conventional • Exhaustible source of energy • Cause pollution • Non renewable • Expensive to store ,maintain and transmit • Suitable for high power applications • Eg. Hydraulic ,steam, nuclear power plants	Non –conventional • Inexhaustible • Environmental friendly • Renewable • Less Expensive • Low power applications • Eg. Solar wind, ,geothermal power plants.	7	7