MODEL ANSWER

SUMMER– 17 EXAMINATION

Subject Title: Basic Thermodynamics Subject Code: 17554

Important Instructions to examiners:

1) The answers should be examined by key words and not as word-to-word as given in the model answer scheme.
2) The model answer and the answer written by candidate may vary but the examiner may try to assess the understanding level of the candidate.
3) The language errors such as grammatical, spelling errors should not be given more importance. (Not applicable for subject English and Communication Skills)
4) While assessing figures, examiner may give credit for principal components indicated in the figure. The figures drawn by candidate and model answer may vary. The examiner may give credit for any equivalent figure drawn.
5) Credits may be given step wise for numerical problems. In some cases, the assumed constant values may vary and there may be some difference in the candidate's answers and model answer.
6) In case of some questions credit may be given by judgment on part of examiner of relevant answer based on candidate's understanding.
7) For programming language papers, credit may be given to any other program based on equivalent concept.

Q. NO.	ANSWER	Marking scheme
1	**ATTEMPT ANY TEN**	**2 X 10**
a	Compressed Natural Gas (CNG):- Petroleum is mixed with natural gas to obtain a highly volatile liquid, known as natural gasoline. When natural gas is cooled, the gasoline condenses. This condensed natural gas is known as Compressed Natural Gas. Liquefied Petroleum Gas (LPG):- A mixture of propane and butane is used as liquid petroleum gas in automobile engines. LPO serves as fuel in place of petrol. It is widely used in cars and trucks.	**1m** **1m**
b	Any observable characteristic of the system is known as property. The basic properties of system are volume, temperature, pressure etc. there are two type of property: 1.Intensive property 2.extensive property	**2m**
c	Kelvin - Planck Statement. According to Kelvin-Planck "It is impossible to construct an engine working in a cyclic process, whose sole purpose is to convert heat energy from a single thermal reservoir into an equivalent amount of work".	**2m**
d	**Point Function** They depend on the state only, and not on how a system reaches that state. All properties are point functions. Those properties, which cannot be located on graph by a point but are given by area or show on the graph	**1m**

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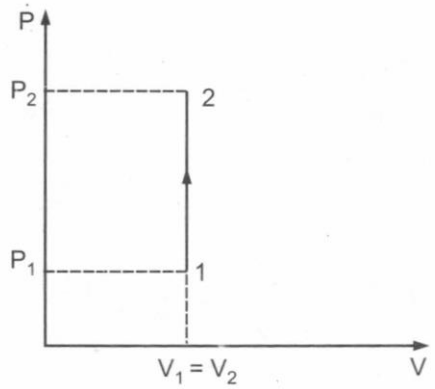
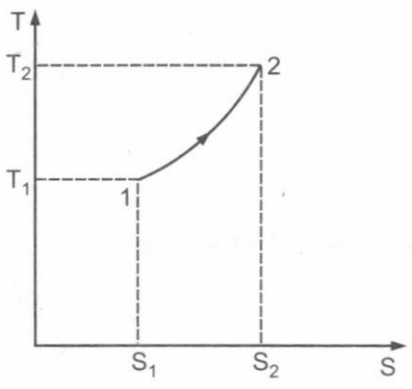
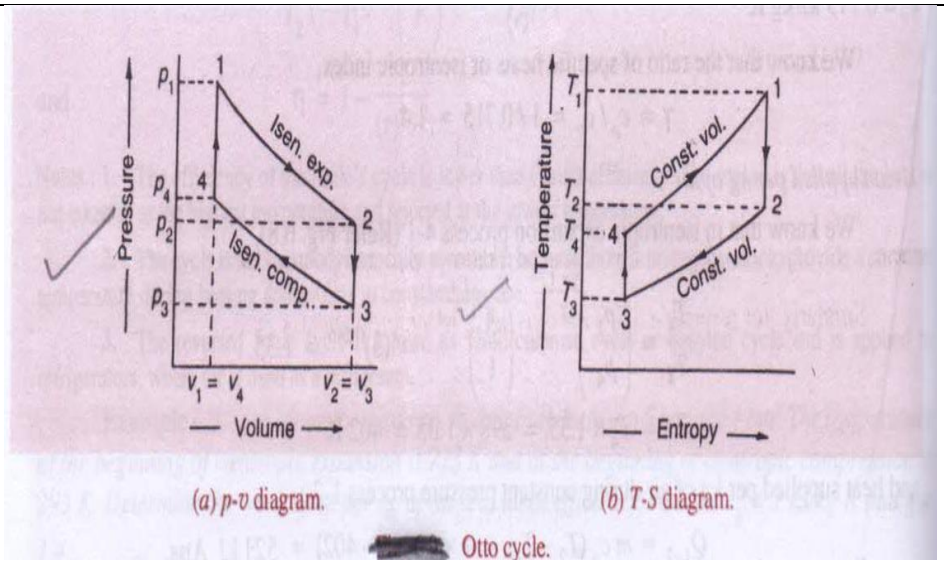
	Path Function Their magnitudes depend on the path followed during a process as well as the end states Work (W), heat (Q), Pressure, volume, enthalpy, internal energy are path functions When the two properties locate a point on graph (coordinates axes) then those properties are known as point function	**1m**
e	Superheated steam: When the dry steam at saturation temperature is further heated at constant pressure, it is converted into superheated steam. The superheated steam behaves more or less like a perfect gas and obeys the laws of perfect gases	**2m**
f	Dryness fraction or quality of wet steam. It is the ratio of the mass of actual dry steam, to the mass of same quantity of wet steam, and is generally denoted by 'x'. Mathematically, x = mg/(mg+mf) Where mg = Mass of actual dry steam, mf = Mass of water in suspension, and m = Mass of wet steam = mg + mf The dryness fraction of dry saturated streams, X=1	1m 1m
g	If the volume of gas remains constant during a process, the process is called as constant volume or isochoric process".  P-V diagrams  T-S diagrams	**2m**
h	Functions of Nozzle: a) It converts a portion of energy of steam into kinetic energy. b) In case of impulse turbine, it directs the steam jets of high velocity against the blades of rotor to convert kinetic energy into shaft work. c) In case of reaction turbines, nozzles are free to move and they discharge high' velocity steam. The reactive force of steam against the nozzle produces motion	**2m**

	and work is obtained.	
i	Cooling towers may be classified as, 1. According to type of draught, (a) Natural draught (b) Forced draught (c) Induced draught. 2. According to material used, (a) Concrete cooling towers (b) Timber cooling towers (c) Steel duct type cooling towers.	**2m**
j	Dalton'S Law of Partial Pressures It states "The pressure of the mixture of air and steam is equal to the sum of the pressures which each constituent would exert, if it occupied the same space by itself." Mathematically, pressure in the condenser containing mixture of air and steam, Pc=Pa+Ps Pa=, pressure in the condenser containing mixture of air and steam Pa = Partial pressure of air, and Ps = Partial pressure of steam.	2m
k	The following are certain factors which controlled denotation 1) The shape of the combustion chamber. 2) The relative position of the sparking plugs in case of petrol engines. 3) The chemical nature of the fuel. 4) The initial temperature and pressure of the fuel. 5) The rate of combustion of that portion of the fuel which is the first to ignite.	2m
l	 Otto cycle.	2m

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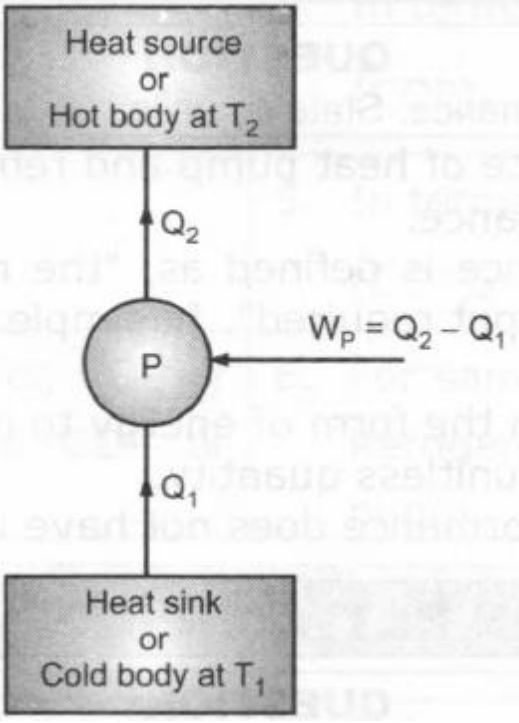
<table>
<tr><td>m</td><td>Pre-ignition occurs due to following reasons:
1) High compression ratio
2) Overheated spark plug point
3) Incandescent carbon deposit in cylinder wall
4) Overheated exhaust valve
5) It may occur due to faulty timing of spark production.</td><td>2m</td></tr>
<tr><td>n</td><td>applications of heat exchanger
a) Dairy industry.
(b) Food industries.
(c) Refrigeration and air-conditioning.
(d) Steam and gas turbine power plants.
(e) Internal combustion engines.
(f) Milk chiller of pasteurizing plant</td><td>2m</td></tr>
<tr><td>Q.2.</td><td>ATTEMPT ANY FOUR</td><td>4 x 4</td></tr>
<tr><td>a</td><td>
<table>
<tr><th>SR NO</th><th>RENEWABLE ENERGY SOURCES</th><th>NONRENEWABLE ENERGY SOURCES</th></tr>
<tr><td>1</td><td>the resources that can be renewed by reproduction are called renewable resources.</td><td>the resources that are present in fixed quantities are called non-renewable resources.</td></tr>
<tr><td>2</td><td>Renewable resources are inexhaustible.</td><td>Non-renewable resources are inexhaustible.</td></tr>
<tr><td>3</td><td>Renewable resources are not affected by the human activities.</td><td>Non-renewable resources are affected by human activities.</td></tr>
<tr><td>4</td><td>All biotic resources are renewable.</td><td>Some abiotic resources are non-renewable.</td></tr>
<tr><td>5</td><td>Clean source of energy</td><td>They will emit pollutants</td></tr>
<tr><td>6</td><td>Cost is much therefore not used much</td><td>Cost is less therefore preferred</td></tr>
<tr><td>7</td><td>Available in the abundant form</td><td>Available in the limited form</td></tr>
<tr><td>8</td><td>For example: air and water.</td><td>For example- fossil fuels and minerals.</td></tr>
</table>
</td><td>4m
(any 4</td></tr>
</table>

b	Heat Pump: • "Heat pump is thermodynamic system, which transfers heat from low temperature body and gives 'out the same to high temperature body" $(COP)_{pump} = \frac{Output}{Input}$ $= \frac{Q_2}{W_p}$ $= \frac{Q_2}{Q_2 - Q_1}$ ... (1.4) In terms of temperature, COP is given as, $(COP)_{pump} = \frac{T_2}{T_2 - T_1}$ •A simple flowdiagram for heat pump is as shown in Fig.  Refrigerator: • "It is a thermodynamic system, which absorbs heat from low temperature body (space to be cooled) and transfers it to high temperature body (atmosphere)	1m 1m

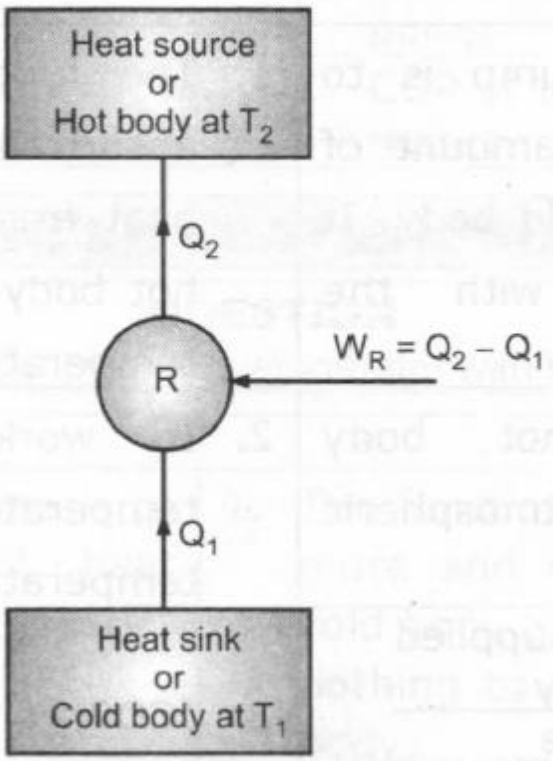
$$(COP)_R = \frac{\text{Output}}{\text{Input}}$$

$$= \frac{Q_1}{W_R} = \frac{Q_1}{Q_2 - Q_1} \quad \ldots (1.5)$$

In terms of temperature, COP is given as,

$$(COP)_R = \frac{T_1}{T_2 - T_1}$$

•A simple flowdiagram for regrigerator is as shown in Fig.



We have, $(COP)_P = \frac{Q_2}{Q_2 - Q_1}$ [From equation 1.4]

and $(COP)_R = \frac{Q_1}{Q_2 - Q_1}$ [From equation 1.5]

$\therefore \quad (COP)_R + 1 = \frac{Q_1}{Q_2 - Q_1} + 1 = \frac{Q_1 + Q_2 - Q_1}{Q_2 - Q_1} = \frac{Q_2}{Q_2 - Q_1} = (COP)_P$

$\therefore \quad (COP)_R + 1 = (COP)_P$

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		2m
c	Total volume (V) = 0.125 m^3 Total Enthalpy (h) = 1800 KJ pressure 10 bar. From steam table at 10 bar h_f = 762.5 KJ/kg h_{fg} = 2013.6 KJ/kg v_g = 0.194 m^3/kg $\therefore m = \frac{V}{v_g} = \frac{0.125}{0.194} = 0.6443$ KJ ——— (2 mark) $\therefore$ mass = (m) = 0.6443 KJ $\therefore$ Hence for m kg $h_f = 0.6443 \times 762.5$ = 491.278 KJ $h_{fg} = 0.6443 \times 2013.6$ = 1297.362 KJ $\therefore h = h_f + x \cdot h_{fg}$ $1800 = 491.278 + x \times 1297.362$ $\therefore x = 1.008$ $\therefore$ ~~dryness~~ dryness fraction $x = 1.008$ ——— (2 mark) Note:– For the given data value of dryness fraction of wet steam is 1.008 but ~~extent~~ it should be less than '1' for wet steam	1m 1m 1m 1m

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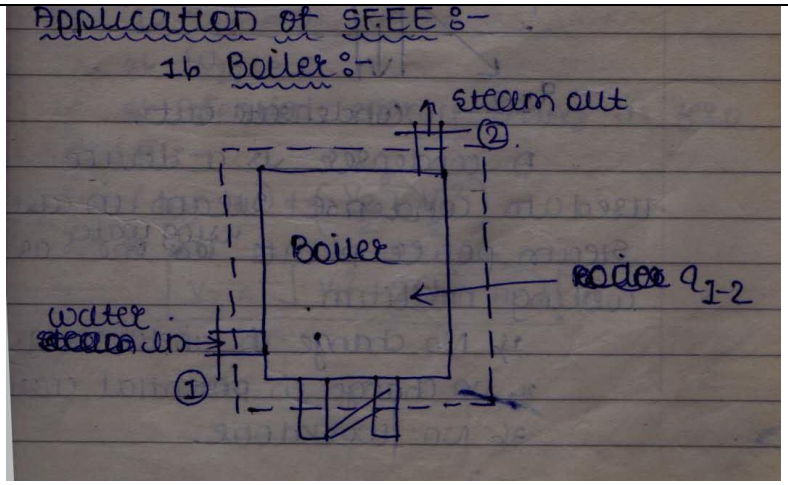
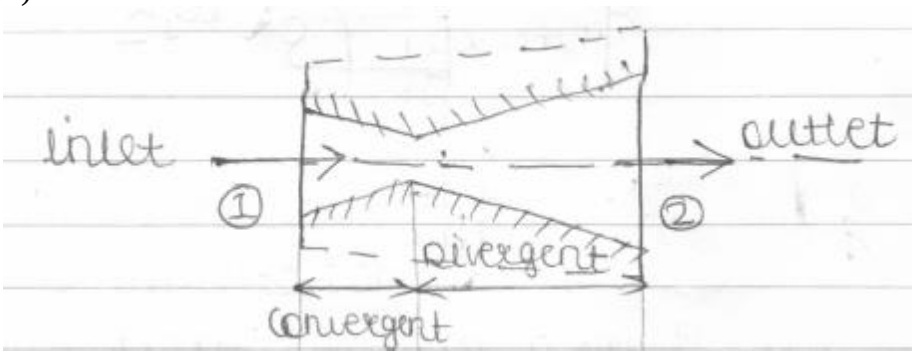
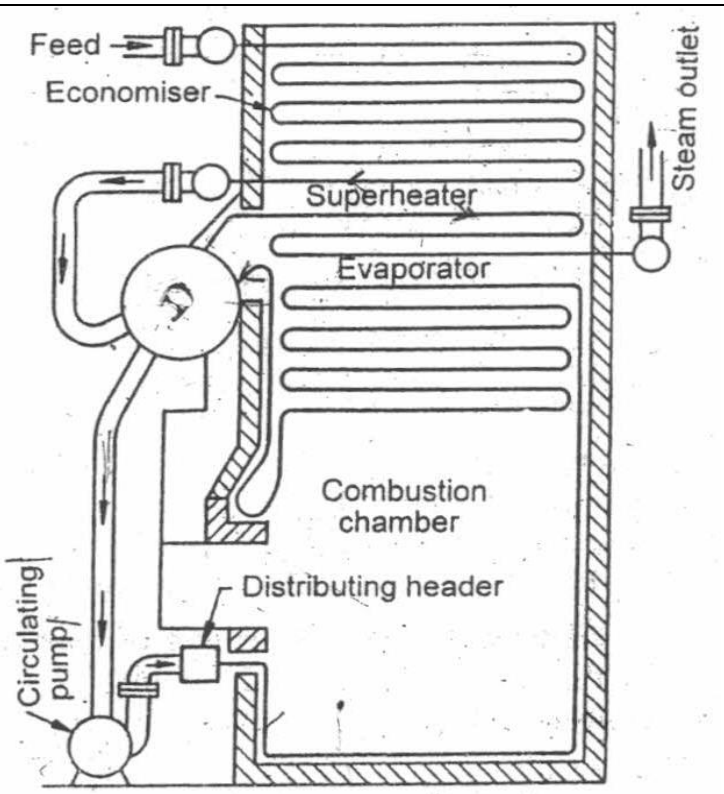
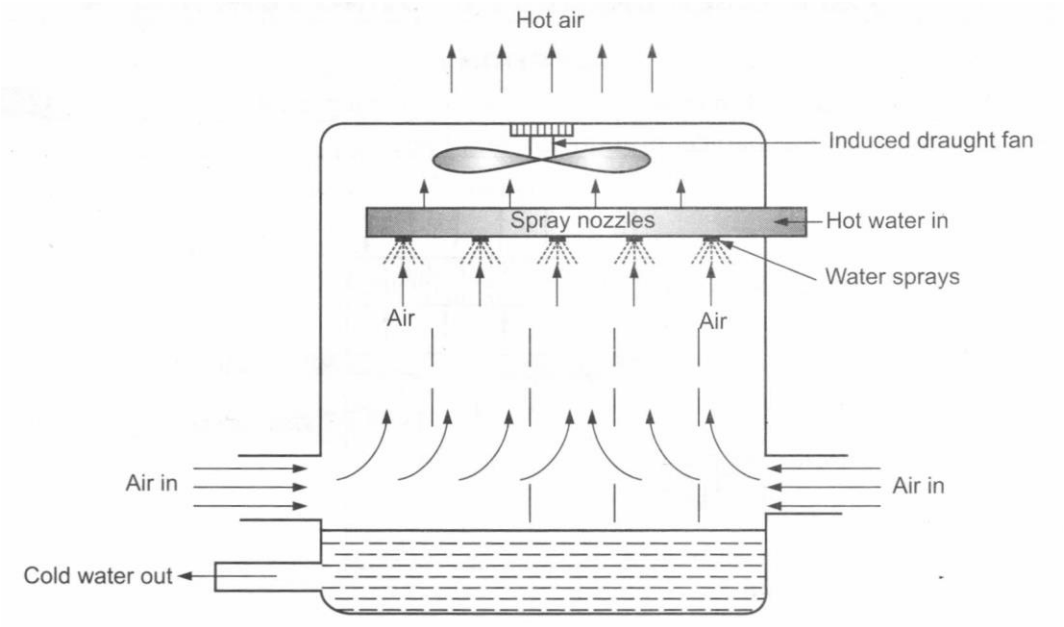
d	Effects of air leakage: 1. It reduces the vacuum pressure in the condenser 2. Since the air is a poor heat conductor it reduces the rate of heat transmission 3.It requires a larger capacity air pump	**4m**
e	Classification of I.C. Engine: 1) According to type of fuel used: a) Petrol engine b) Diesel engine c) Gas engine 2) According to method of igniting the fuels: a) Spark ignition engine(S.I engine or petrol engine) b) Compression engine(C.I engine or diesel engine) 3) According to number of stroke per cycle: a) Four stoke b) Two stoke 4) According to the cycle: a) Otto cycle b) Diesel cycle c) Dual cycle 5) According to speed of engine: a) Low speed b) Medium speed c) High speed 6) According to cooling system: a) Air cooled b) Water cooled 7) According to method of fuel injection: a) Carrborator engine b) Air injection engine	4m(any four)
f	I According to type of Contact 1.Direct type of contact heat exchanger 2.Indirect type of contact heat exchanger II.According to flow of coolant 1.Parellel flow heat exchanger	2 m(class.)

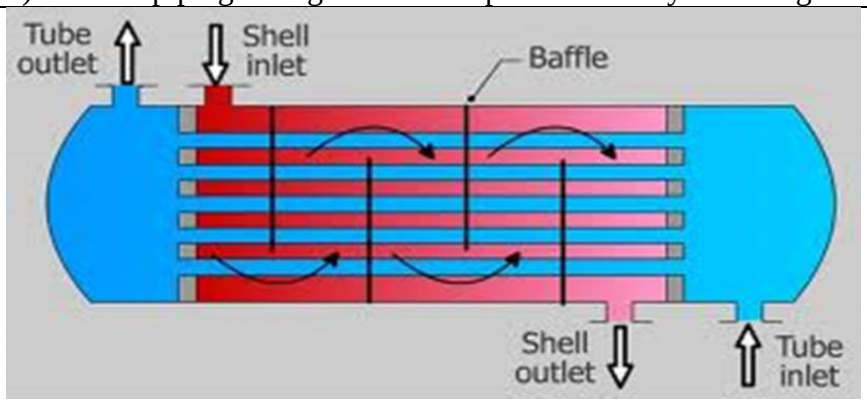
	2.Counter flow heat exchanger III According to construction 1.Shell and tube heat exchanger 2.Double pipe heat exchanger 3.Plate type heat exchanger 4.Plate and shell type heat exchanger. IV. According to nature 1.Natural type of heat exchanger 2.Forced type of heat exchanger. Materials for heat exchangers: 1.Heat conductive coppers 2. Brasses. 3. Stainless Steel. 4. Aluminum Bronzes.	2m (matr.)
Q.3.	Attempt any four	**4 x 4**
a	SFEE: $h_1+V_1^2/2+gZ_1+q_{12}= h_2+V_2^2/2+gZ_2+W_{12}$ i)For boiler	**2m**

	 It is a device which supplies heat to water and generates steam. 1) No change in kinetic energy 2) No change in potential energy 3) No work done. SFEE $q_{12}=h_2-h_1$ ii)Nozzle  It is a a device which increses the velocity of working substance,the nozzle insulated so that no het transfer take place. 1.$q_{12} = 0$ 2.$w_{12} = 0$ 3.Potential energy change is zero. SFEE; $(h2-h1) + \{(v_2^2)/2 – (v_1^2)/2)\} =0$ $v_2=\sqrt{\{v_1^2 +2(h_1-h_2)\}}$	**2m**
b	Zeroth law of thermodynamic: This law states “when two system are each in thermal equilibrium separately with	

	a third system, then two systems are also in thermal equilibrium in each other."	1m
	• When two bodies having different temperature are brought in contact with each other, after some time, both bodies attain same temperature. When this state of equal temperature is attained, then the bodies are said to be in thermal equilibrium. • Take three bodies namely A, B and C. Suppose A and C are in thermal equilibrium. Similarly let B and C are also in thermal equilibrium, then Zeroth's law states that bodies A and B are also in thermal equilibrium. • Thus, according to Zeroth's law, if two systems are each in thermal equilibrium with a third system, then the two systems are also said to be in thermal equilibrium with each other.	2m
		1m
c	La-Mont Boiler	2m(dia)

	 This is a modem high pressure water tube steam boiler working on a forced circulation. The water circulation is maintained by a centrifugal pump, driven by a steam turbine, using steam from the boiler. The forced circulation causes the feed water to circulate through the Water walls and drums equal to ten times the mass of steam evaporated. This prevents the tubes from being overheated.A diagrammatic sketch of La-Mont steam, boiler is shown in Fig. The feed water passes through the economizer to an evaporating drum. It is then drawn to the circulating pump through the tube. The pump delivers the feed to the headers, at a pressure above the drum pressure. The header distributes water through nozzles into the generating tubes acting in parallel. The water and steam from these tubes passes into the drum, The steam in the drum is then drawn through the super heater.	2m(expl.)
d	function of cooling tower 1. The function of cooling tower is to cool the water (hot) coming from the condenser by exposing it to the atmospheric air. The water so cooled may be recirculated in the condenser. (a) In a cooling tower, water is made to trickle down drop by drop, so that, it	2m (funct.)

	comes in contact with the air moving in opposite direction. (b) As a result of this, some water gets evaporated and is taken away with air. (c) In evaporation, the heat is taken away from the bulk of water, which is thus cooled. 2. In case of shortfall, the water from cooling tower is also used as feed water for steam turbine power plant. **Induced draught cooling tower** • Working of this cooling tower is same as that of forced draught type. • Only difference is that, the circulation of air is produced by means of fans placed at the top of tower. i.e. air enters at the bottom due to vacuum created inside cooling tower. • It is also called as mechanical draught cooling tower.  	1m 1m
e	Turbo charging About 30% of heat input goes with exhaust gases. The exact percentage depends upon the type of engine and its operating conditions. This exhaust gas can be used to run a gas turbine. The gas turbine develops the sufficient power to drive centrifugal compressor, which is used to supply the air to engine. This results in increased power output and better thermal efficiency of engine. Thus, supercharging done by driving	**2m**

	compressor with the help of gas turbine utilizing exhaust of engine is called as 'turbo charging'. Advantages:- 1) In case the pressure ratio is kept constant for turbine, the recovery of exhaust energy of the engine is efficient. 2) Specific fuel consumption is low. 3) Turbine efficiency is high. 4) Exhaust piping arrangement is simple for multi cylinder engines.	**2m**
f	 Working:- As its name implies, this type of heat exchanger consists of a shell (a large pressure vessel) with a bundle of tubes inside it. One fluid runs through the tubes, and another fluid flows over the tubes (through the shell) to transfer heat between the two fluids. Two fluids, of different starting temperatures, flow through the heat exchanger. One flows through the tubes (the tube side) and the other flows outside the tubes but inside the shell (the shell side). Heat is transferred from one fluid to the other through the tube walls, either from tube side to shell side or vice versa. The fluids can be either liquids or gases on either the shell or the tube side. In order to transfer heat efficiently, a large heat transfer area should be used, leading to the use of many tubes. In this way, waste heat can be put to use. This is an efficient way to conserve energy.	2m(dia.) 2m(expl.)
Q.4.	Attempt any four	**4 x 4**
a	Entropy: It is a function of a quantity of heat which shows the possibility of conversion of that heat into work. Entropy is a thermodynamic property of a system which increases with addition of heat and decreases with removal of heat.	**2m**

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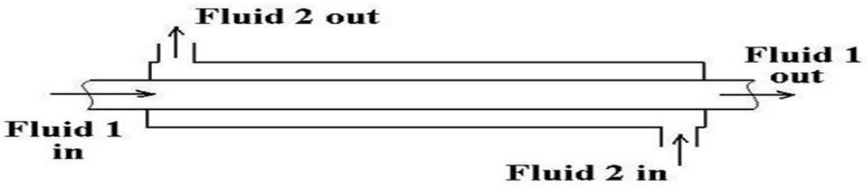
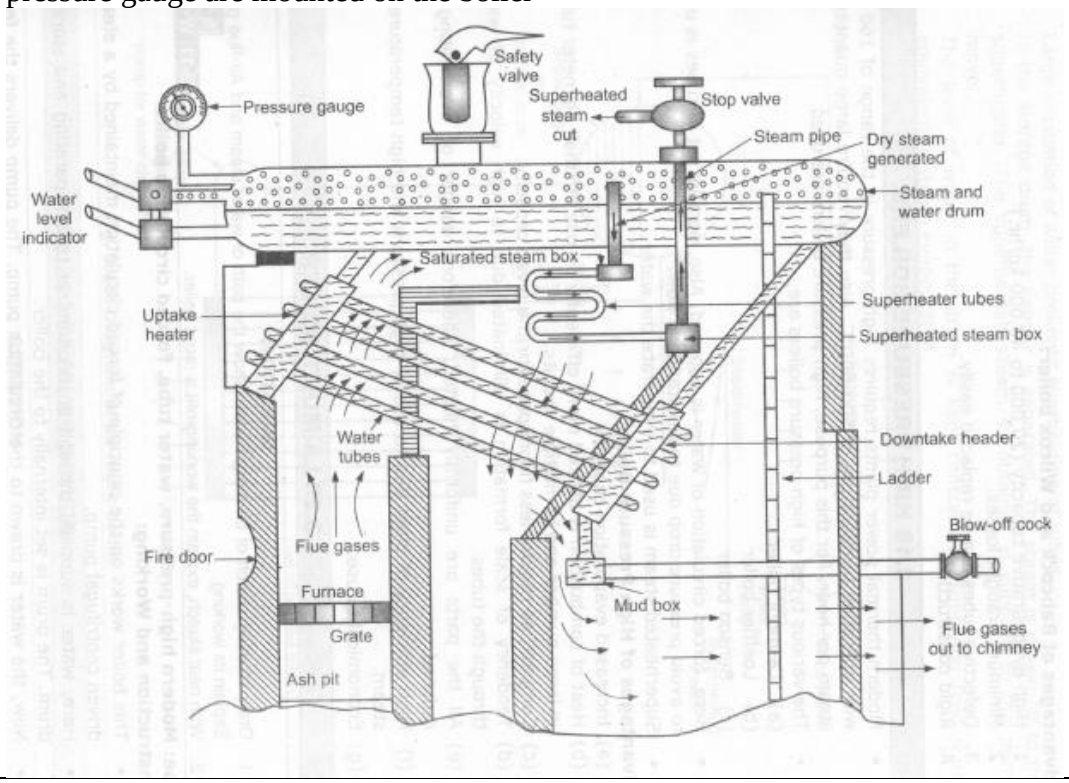
	$\Delta S = dQ/T$ where, dQ=Small change in heat T =Temp.	**2m**
b	Mountings: Mountings are safety devices that, control the process of steam generation.These are essential for boiler.These are the fittings mounted on the boiler.Examples are water level indicator,safety valve. Accessories: Accessories increase the efficiency of boiler plant. These are auxiliary. These are the integral parts of the boiler. Examples are feed pump, super heater and economizer.	**2m** **2m**
c	Classification of the steam boiler 1)According to the content in the tube may be classified as: a) Fire tube or smoke tube boiler b) Water tube boiler 2)According to method of circulation of water and steam may be classified as: a) Natural circulation boiler b) Forced circulation boiler 3)According to the number of tubes may be classified as: a) Single tube boiler b) Multitube boiler 4)According to the Position of the Furnace: (a) Internally fired boilers: (b) Externally fired boilers: 5)According to the Axis of the Shell: (a) Vertical boilers: (b) Horizontal boilers: 6)According to the Use: (a) Stationary boilers: (b) Mobile boilers:	4m (any four) 1
d	Vacuum Efficiency: Vacuum efficiency is the ratio of actual vacuum at inlet to condenser to the maximum or ideal vacuum which can be obtained in a perfect condensing plant nv =Actual vacuum/Ideal vacuum Actual vacuum = barometric pressure- Actual pressure Ideal vacuum =Barometric pressure- Ideal pressure (or pressure corresponding to	2m

	temperature of condenser) Condenser efficiency: Condenser efficiency is defined as ratio of temperature rise of cooling water to the difference in vacuum temperature and inlet cooling water. nc =Temperature rise of cooling water/Vacuum temperature inlet cooling water temperature =to-ti/tv-ti Where to = outlet temperature of cooling water ti= inlet temperature of cooling water tv =Vacuum temperature or saturation temperature corresponding to condenser pressure	2m
e	To improve the properties by addition of chemical of compound called additives The main additives as following: 1) Detergents- dispersant: These additives improve the detergent action of the lubricating oil by keeping the deposit in suspension form ads this additives are oil soluble. E.g.Metalics salts or organic acids 2) Pour point depressors: Lubricant contain paraffin compound and form wax precipitates as they cooled .Wax reduc e fluidity of oil temperature pour depressants are add to lower the pour points of lubrication oil. e.g. polymerized phenols , Easter ,alkylated naphthalene oil 3) Anti-foam agent: This assistive prevent the formation of foam by reducing surface tension, which allow air bubble to separate from oil more rapidly. e.g. Silicon polymers 4) Rust inhibitors: These prevent rusting of ferrous engine parts during storage and from acidic moisture accumulation during cold engine operation e.g. Metal sulphates, fatty acid and amines.	4m(any four)

f	 **Double Pipe Heat Exchanger Counterflow** Counter flow, as illustrated in Figure 4, exists when the two fluids flow in opposite directions. Each of the fluids enters the heat exchanger at opposite ends. Because the cooler fluid exits the counter flow heat exchanger at the end where the hot fluid enters the heat exchanger, the cooler fluid will approach the inlet temperature of the hot fluid. Counter flow heat exchangers are the most efficient of the three types. In contrast to the parallel flow heat exchanger, the counter flow heat exchanger can have the hottest cold fluid temperature greater than the coldest hot-fluid temperature.	2m 2m
Q.5.	Attempt any two	**8 x 2**
a	Babcock and Wilcox boiler Construction and Working: • It consists of a steam and water drum. • It is connected to uptake header and downtake header with the help of short tubes. • The water tubes, which are inclined at 15° to the horizontal, are used to connect the uptake header to the downtake header. There are plenty of.such water tubes. • A mud box provided with downtake header is used to remove the settled down mud. • Fire door is provided for a man to enter the boiler for repairing and cleaning. • Hot gases from the furnace are forced to the uptake header, and moves upwards between the tubes. Also, baffles are provided between the tubes, which deflect the direction of flue gases, to utilize the maximum amount of heat. • The flue gases after passing over the tubes, are exhausted to atmosphere through chimney. • Water circulates from the drum into the downtake header and through the	**4m (expl.)**

	tubes to uptake header and again to the drum. Water continues to circulate in this way, till it is evapourated. • A steam superheater consists of a large number of steel tubes and contains two boxes; one is superheated steam box and other is saturated steam box. • The steam generated above the water level in the drum flows down through the dry pipe into the saturated steam box and then into the superheated steam box. The steam, during its passage through tube, gets further heated and becomes superheated. The steam is now taken through the outlet pipe to the stop valve. • Mountings, such as, safety valve, feed valve, water level indicator and pressure gauge are mounted on the boiler  	**4m(dia.)**
b	Steam turbines can be classified in the following ways: 1. According to the working principle: (a) Impulse turbine (b) Reaction turbine (c) Combined impulse and reaction turbine. 2. According to number of stages of expansion of steam:	4m(class.)

	(a) Single stage steam turbine (b) Multistage steam turbine 3.According to position of shaft: a) Horizontal turbine (b) Vertical turbine 4. According to pressure of steam supplied: (a) High pressure (b) Medium pressure c) Low pressure S. According to direction of steam flow: (a) Axial flow (b) Radial flow Cc) Tangential flow 6. According to exhaust steam pressure: (a) Condensing type (b) Non-condensing type 7. According to method of governing: (a) Throttle (b) Nozzle (c) Bypass Reaction turbine	

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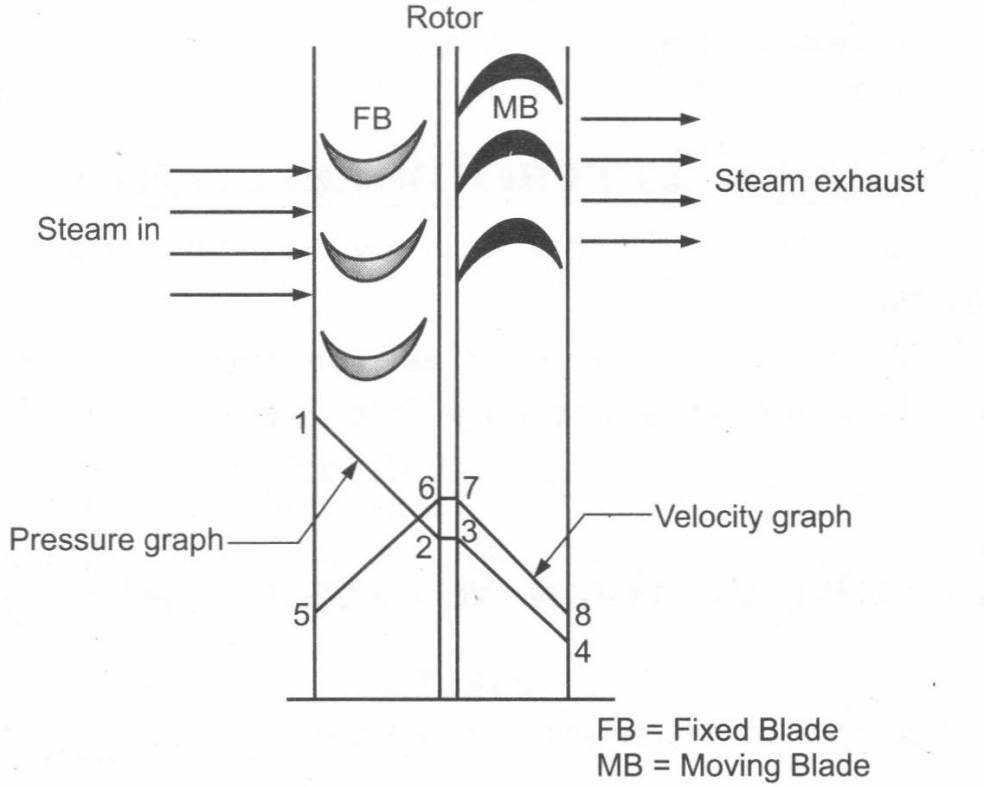


4m(turbine)

Construction: It consists of following parts.

1. Casing:

• It is an air-tight metallic case, which constitutes the guide mechanism and turbine runner. The steam enters the fixed blades (Guide mechanism) with a uniform velocity.

2. Guide mechanism:

• It consists of guide blades fixed to the casing. Therefore the guide blades are also called as fixed blades.

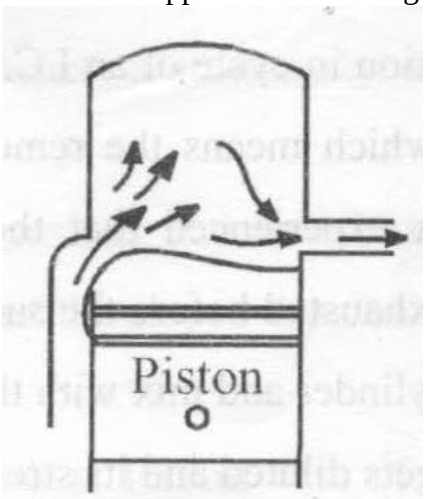
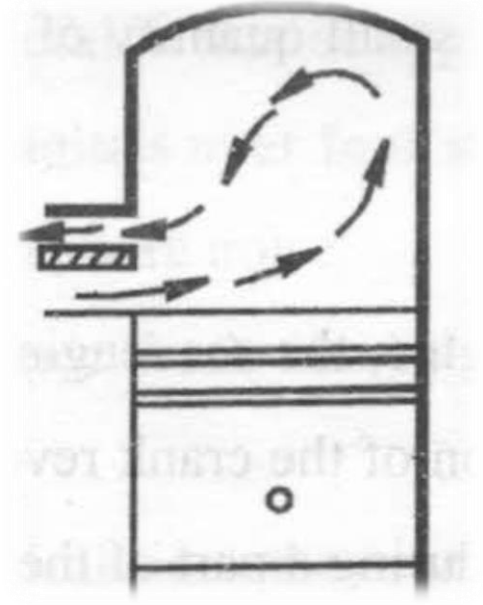
• The fixed blades are used to,

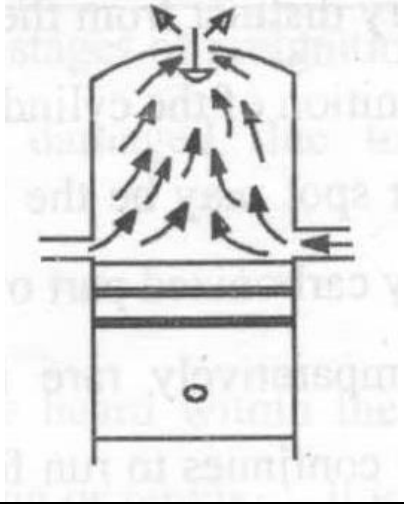
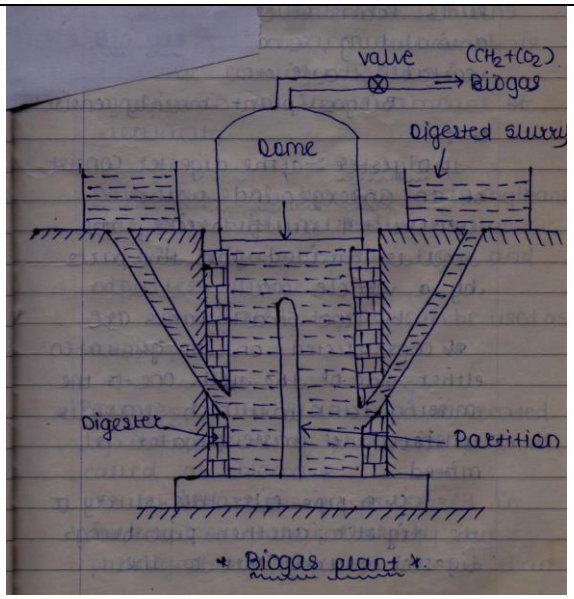
(a) Allow the steam to enter the runner without shock.

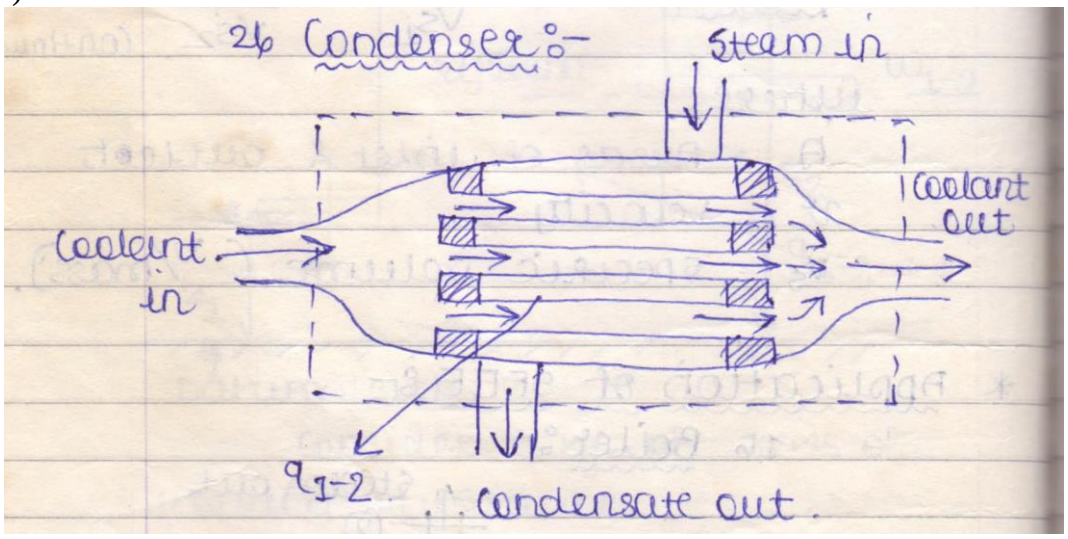
(b) Regulate the required quantity of steam to enter the turbine by adjusting the opening of blades.

3. Turbine runner:

	• It consists of runner blades fixed to a shaft. The runner blades are properly designed in order to allow the steam to enter and leave without shock. • The surface of runner blades is made smooth to minimize frictional losses. 4. Draft tube: • The steam, leaving the runner blade is allowed to flow into condenser through a tube, called as draft tube. • If the draft tube is not provided in the turbine, then the steam will move freely and will cause steam eddies to set up. Working: • In this type of turbine, there is gradual pressure drop and takes place continuously over the fixed and moving blades. Fig. shows a reaction turbine. • The top portion shows the arrangement of fixed and moving blades. • The function of fixed blades is same as the nozzle that they alter the direction of steam as well as they allow steam to expand to have larger velocity. • As the steam passes over the moving blades, the kinetic energy obtained due to fall in pressure, is absorbed by them. • The bottom portion of the figure shows approximate changes in velocity and pressure during the flow of steam. • Since the pressure drop per stage is small, therefore the number of stages required is much higher than an impulse turbine of same capacity. • Pressure' in reaction turbine is reduced in the fixed blades as well as moving blades. • The velocity of steam is increased in fixed blades and is decreased while passing through moving blades. • 1-2-3-4 in pressure graph represents pressure at entrance of fixed blades, exit of fixed blades, entrance of moving blades and exit of moving blades. • 5-6-7-8 in velocity graph represents velocity at entrance of fixed blade, exit of fixed blade, entrance of moving blades and exit of moving blades.	

c	Scavenging: the process of removing burnt gases from the combustion chamber of the engine cylinder is known as scavenging. Following are the methods of scavenging: 1. Cross flow scavenging: in this the transfer port and exhaust port are situated on opposite sides of engine cylinder  2. Back-flow or loop scavenging: in this method the inlet and outlet ports are situated on same side of engine cylinder  3. Uniflow scavenging: in this method, the fresh charge while entering from one side of the engine cylinder pushes out the gases through exit valves	**2m def.** **2m** **2m** **2m**

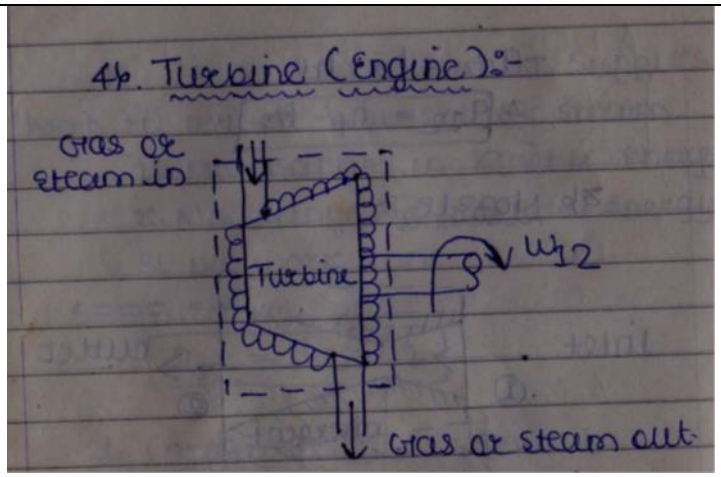
		
Q.6.	Attempt any four	**4 x 4**
a	 Bio gas Energy Bio gas is a mixture of gases product during decay of biomass in the absence of oxygen .methene is the main constituent od biogas,which is an execllent fuel,Forms of biogmass are animal dung,sewage,crape residueaa,vegetable wastea etc Biogas plant mainly consists of 1.Digester The digester consists of an underground well constructed with brick mssonary wall.The well is divided into two parts by vertical wall.Two small tanks are constructed on the ground on either side of the well.One is the mixiry tank in which the slurry consisting of waste and water is mixed.A pipe feeds the slurry is to the digester.another pipe is there through which digegest slurry is brought out	2m(dia.) 2m(expl.)

	and collected in second tank. 2.Gas Holder The gas holder is a tank placed on top od the digester.It containts upto 75% methane.It is an exceelet fuel and burn without producing smoke.*t used for cooling lighing and generation of small electricity.*	
b	(a) Extensive Property: "The properties, which are dependent on mass, are called as extensive properties". For example: Mass, volume, enthalpy, entropy ,volume and energy etc (b) Intensive Property: "The properties, which are independent of mass, are called as intensive properties". For example: Pressure, temperature , density, specific volume, specific,specific volume etc	2m 2m
c	SFEE: h1+V12/2+gZ1+q12= h2+V22/2+gZ2+W12 i)condenser:  It is a device used to condense steam in case of steam power plants using water as cooling medium. 1.No change in Kinetic energy 2.No change in Potentntial energy 3.No work done $-q_{12}=h_2-h_1$ There for $q_{12}=h_1-h_2$ ii)Turbine:	**2m**

MODEL ANSWER

SUMMER– 17 EXAMINATION

Subject Title: Basic Thermodynamics Subject Code: 17554

	 It is devices which convert energy of working substance into a work. The turbine is insulated so. 1) $Q_{12} = 0$ 2) No change in kinetic energy 3) No change in potential energy SFEE: $W_{12} = h_2 - h_1$	**2m**
d	1.Fusible Plug To put off the fire in the furnace of the boiler, when the level of water in the boiler falls to an unsafe limit, and thus avoids the explosion, which may take place due to overheating of tubes and shell 2.Blow-off Cock 1. To empty the boiler, whenever required for the purpose of inspection and repair. 2. To discharge the mud, scale or sediments, which are accumulated at the'bottom of the boiler 3.Economizer Used to heat feed water by utilizing the heat in the exhaust flue gases be: leaving through the chimney. 4.Superheater Its purpose is to increase the temperature of steam above its saturation temperature without raising its pressure.	**4m(one each)**
e	Sources of Air into the Condenser The following are the main sources through which the air may enter into the condenser:	4m

	1.The dissolved air in the feed water enters into the boiler, whicfri rn enters into the condenser with the exhaust steam. . 2. The air leaks into the condenser, through various joints, due to high vacuum pressure in the condenser. 3. In case of jet condensers, dissolved air with the injection water enters into the condenser	
f		4m(any four)

Sr no	Two Stroke	Four Stroke
1	The two-stroke engine completes one cycle of events for every revolution of the crankshaft	completes one cycle of events with the two revolutions required for the four-stroke engine cycle.
2	Theoratical power developed is more	Theoratical power developed is less
3	There are fewer working parts in a two-stroke engine	There are more working parts in four-stroke engine.
4	Cheap to manufacture	Expensive to manufacture.
5	Maintenance is less	Maintenance is more.
6	Self lubrication by mixing with fuel.	Separate lubrication is required.
7	Need of Scavenging	No need of scavenging.
8	Operation is smooth.	Operation is not much smooth.
9	More Pollution	Less pollution.
10	Light in weight	Heavier than two stroke.