
Subject Code

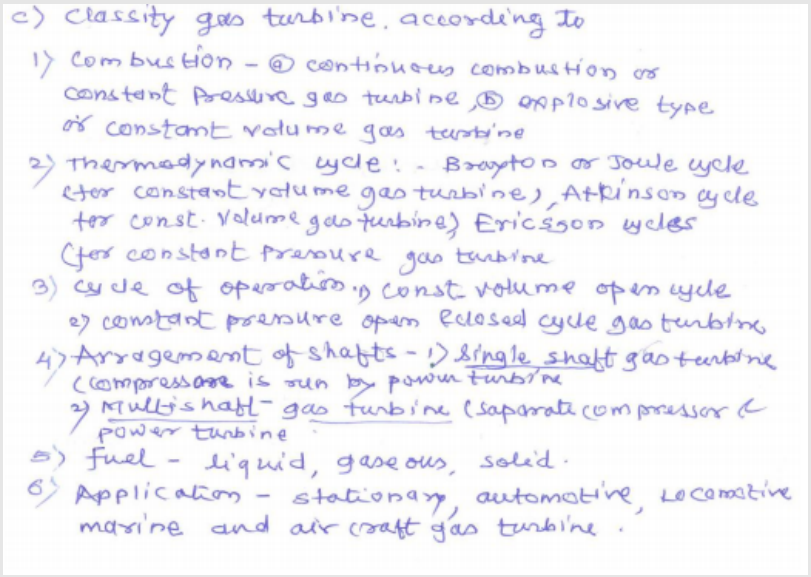
- Any - ▼

Chapter Name

- Any - ▼

Apply

Examination: 2017 SUMMER

Que.No	Marks	
Q 1a)(c)	4	Question: **Classify gas turbines (any four)** Answer:  c) Classify gas turbine according to 1) Combustion - (a) continuous combustion or constant pressure gas turbine (b) explosive type or constant volume gas turbine 2) Thermodynamic cycle :- Brayton or Joule cycle (for constant volume gas turbine), Atkinson cycle for const. volume gas turbine) Ericsson cycles (for constant pressure gas turbine 3) Cycle of operation - 1) const volume open cycle 2) constant pressure open /closed cycle gas turbine 4) Arrangement of shafts - 1) Single shaft gas turbine (compressor is run by power turbine 2) Multi shaft - gas turbine (separate compressor & power turbine 5) fuel - liquid, gaseous, solid. 6) Application - stationary, automative, Locomotive marine and air craft gas turbine. ----------

<table>
<tr><th>Que.No</th><th>Marks</th><th></th></tr>
<tr><td>Q 3 d)</td><td>4</td><td>Question:
Differentiate between closed cycle and open cycle gas turbine

Answer:
<table>
<tr><th>Closed Cycle Gas Turbine</th><th>Open Cycle Gas Turbine</th></tr>
<tr><td>1. The compressed air is heated in heating chamber.</td><td>1. The compressed air is heated in combustion chamber.</td></tr>
<tr><td>2. As the gas is heated by an external source, hence the amount of gas remains same thought the cycle</td><td>2. The products of combustion are get mixed up in the heated air hence same gas doesn't remain in cycle.</td></tr>
<tr><td>3. The gas after turbine is passed into the cooling chamber.</td><td>3. The gas after turbine is exhausted into the atmosphere.</td></tr>
<tr><td>4. The working fluid is circulated continuously.</td><td>4.The working fluid is replaced continuously.</td></tr>
<tr><td>5. Any fluid with better thermodynamic properties can be used.</td><td>5. Only air is used as the working fluid.</td></tr>
<tr><td>6. The turbine blades do not wear away earlier, as the enclosed gas does not get contaminated while flowing through heating chamber.</td><td>6. The turbine blades wear away earlier, as the air from atmosphere get contaminated while flowing through combustion chamber.</td></tr>
<tr><td>7.The mass of installation per Kwatt is more</td><td>7.The mass of installation per Kwatt is less</td></tr>
<tr><td>8. High maintenance cost</td><td>8. Maintenance cost is low</td></tr>
</table>
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<tr><td>Q 4a)(c)</td><td>4</td><td>Question:
Classify gas turbines on the following basis : i) Working cycle ii) Application iii) Cycle of operation iv) Fuels

Answer:
<table>
<tr><td>Basis</td><td>1</td><td>2</td></tr>
<tr><td>Working Cycle</td><td>Brayton(P=constant)</td><td>Atkinsons(V=constant)</td></tr>
<tr><td>Application</td><td colspan="2">Aero-derivative gas turbines, Amateur gas turbines, Auxiliary Gas turbines, Industrial Gas turbines.</td></tr>
<tr><td>Cycle of operation</td><td>Open Cycle</td><td>Closed Cycle</td></tr>
<tr><td>Fuels</td><td colspan="2">Coal, Producer gas, Blast Furnace gas, Diesel, paraffin, oil and pulverized coal</td></tr>
</table>
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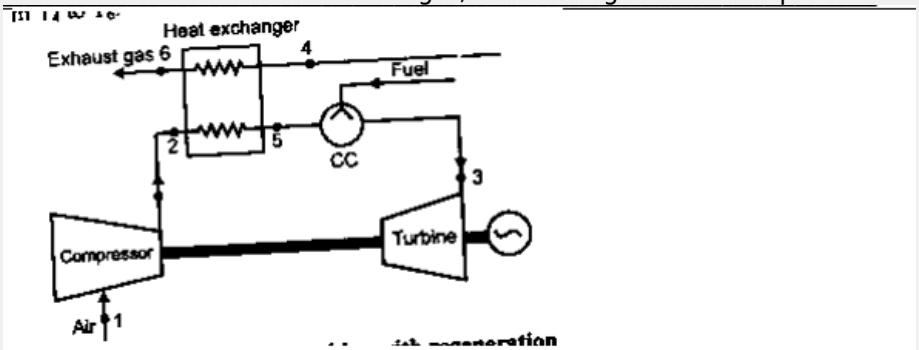
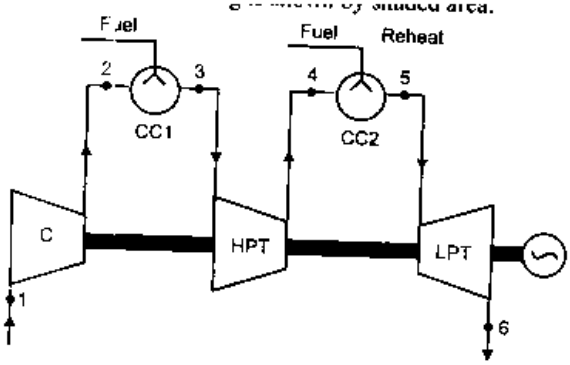
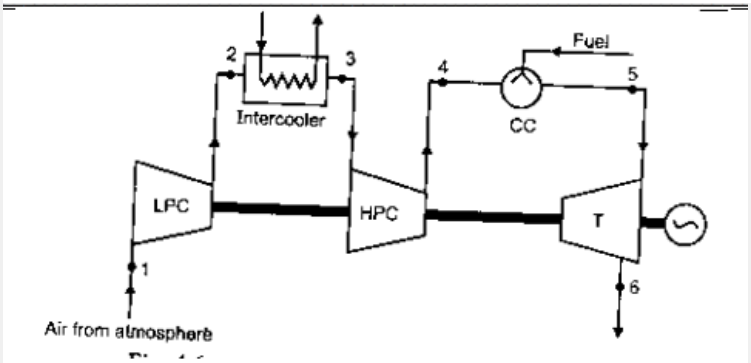
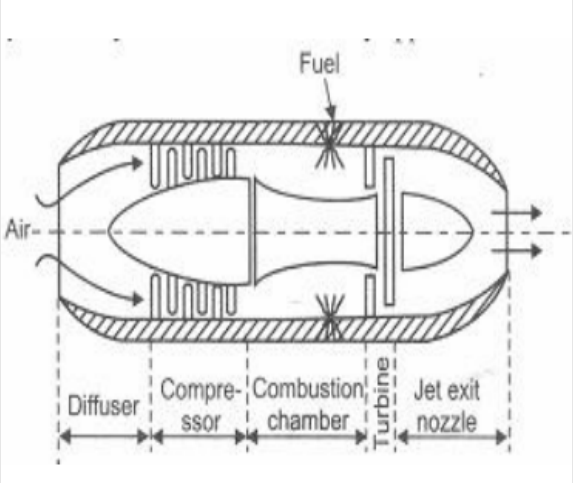
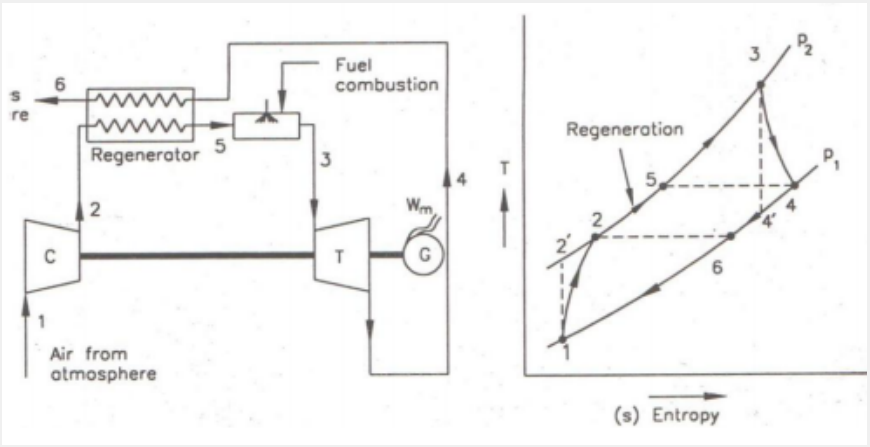
</table>

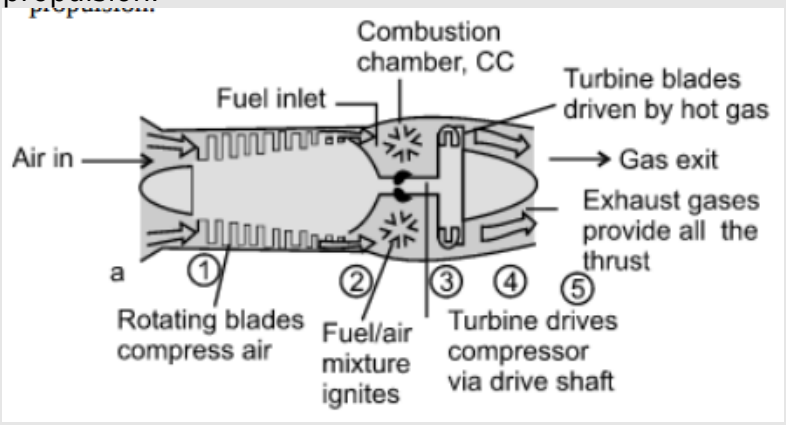
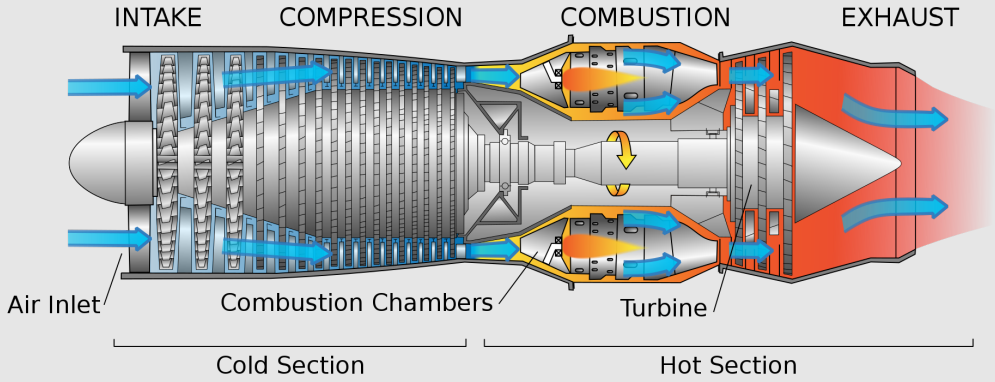
Que.No	Marks	
Q 5 b)	8	Question: **State the methods used to improve thermal efficiency of gas turbine and explain any one.** Answer: Methods to improve thermal efficiency of gas turbine Regeneration – This is done by preheating the compressed air before entering to the combustion chamber with the turbine exhaust in a heat exchanger, thus saving fuel consumption..  2) **Improving turbine output: this can be done by** **(a) Reheating** : The whole expansion in the turbine is achieved in two or more stages &reheating is done after each stage.  **(b) Increasing the value of maximum cycle temp.** **(c) Improving turbine efficiency by improving design.** **3. Reducing compressor input: By** **(a) Intercooling** : Compressor work is reduced by intercooling the air between the compressor stages.  (b)By lowering inlet temp to compressor (c) By increasing compressor efficiency (d) Water injection at inlet to compressor ----------

Que.No	Marks	
Q 6 c)	4	Question: **Draw the schematic diagram of turbojet engine.** Answer: Turbo Jet Engine  ----------

Examination: 2017 WINTER

Que.No	Marks	
Q 1a)(d)	4	Question: **Classify gas turbine on the basis of a) Cycle of operation b) Thermodynamic cycle c) Application d) Combustion process** Answer: Classification of gas turbine on the basis of a. Cycle of operation 1. Open cycle 2. Closed cycle b. Thermodynamic cycle 1. Brayton or Joules cycle 2. Atkinson cycle 3. Erricsson cycle c. Application 1. For supercharging of IC engine 2. For locomotive propulsion 3. For ship propulsion 4. Industrial application 5. Air craft engines 6. Electric power generation d. Combustion process 1. Continuous combustion 2. Explosion combustion ----------

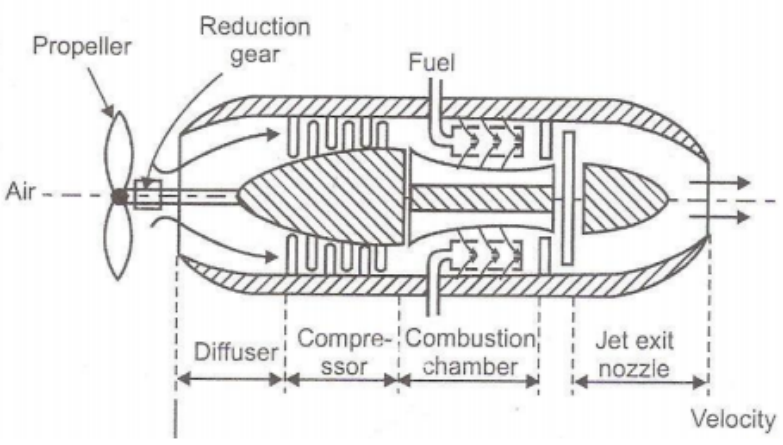
Que.No	Marks	
Q 1b)(b)	6	Question: **Explain regeneration method to improve thermal efficiency of gas turbine with the help of flow diagram and T-S diagram.** Answer: **Regenerative method to improve thermal efficiency in gas turbines** : The exhaust gases a lot of heat as their temperature is far above the ambient temperature . The heat of exhaust gases can be used to heat the air coming from the compressor thus reducing the mass of the fuel supplied in the combustion chamber as shown in the figure. This method is called regenerative method.  ----------

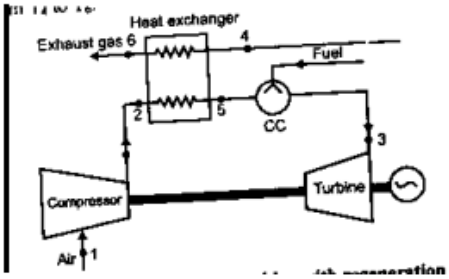
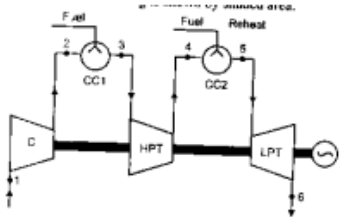
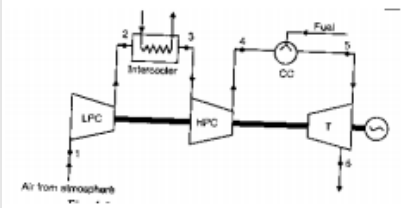
Que.No	Marks	
Q 3 d)	4	Question: **Explain the working principle of turbojet with neat sketch.** Answer: Turbojet engine working principle **Turbojet engine working principle :** shows the schematic of turbojet engine. It has a diffuser section at inlet for realizing some compression of air passing through this section. Due to this air reaching compressor section has pressure more than ambient pressure. This action of partly compressing air by passing it through diffuser section is called “ramming action” or “ram effect”. Subsequently compressor section compresses air which is fed to combustion chamber and fuel is added to it for causing combustion. Combustion products available at high pressure and temperature are then passed through turbine and expanded there. Thus, turbine yields positive work which is used for driving compressor. Expanding gases leaving turbine are passed through exit nozzle where it is further expanded and results in high velocity jet at exit. This high velocity jet leaving nozzle is responsible for getting desired thrust for propulsion.  Turbojet engine working principle is demonstrated below.  The turbojet is an air breathing engine which takes air and then adds heat to it before expanding it. ----------

Que.No	Marks	
Q 3 e)	4	Question: **State the advantages of closed cycle gas turbine over open cycle gas turbine (any four).** Answer: **Advantages of closed cycle gas turbine over open cycle gas turbine:** (i) It has higher thermal efficiency for the same minimum and maximum temperature limits and for the same pressure ratio. (ii) Since the heating is external, any kind of fuel even solid fuel having low calorific value may be used. (iii) There is no corrosion due to circulation of combustion product. (iv) As the system is a closed one there is no loss of the working fluid. (v) The size of the turbine will be smaller compared to an open cycle gas turbine of the same output. (vi) The regulation is more simple. (vii) The heat transmission coefficient in the exchanger is better due to the increase in suction pressure. (viii) Loss due to fluid friction is less due to higher Reynolds number. ----------
Q 6 e)	4	Question: **State the applications of gas turbine (any four).** Answer: **Following are the applications of gas turbine** 1. It is used for electric power generation. 2. It is used for locomotive propulsion. 3. It is used for ship propulsion. 4. Gas turbine is used in aircrafts. 5. It is used for supercharging for heavy duty Diesel engines. 6. Used in turbo jet and turbo-propeller engine. 7. It is used for various industrial purpose such as in steel industry, oil and other chemical industry. ----------

Examination: 2016 SUMMER

Que.No	Marks	
Q 3 b)	4	Question: **Classify gas turbine on the basis of i) working cycle ii) application iii) cycle of operation iv) fuel used** Answer: 1. On the basis of combustion process a) Constant pressure type b) Constant volume or explosion type 2. On the basis of path of working substance a) Open cycle gas turbine b) Closed cycle gas turbine 3. On the basis of action of expanding gases a) Impulse gas turbine b) Impulse reaction gas turbine 4. On the basis of direction of flow a) Axial flow b) Radial flow ----------

Que.No	Marks	
Q 5 c)	8	Question: **Explain the working of 'Turbo-Prop' engine with neat sketch.** Answer: The main components of turbo-prop engine are a propeller, gear reduction unit, a compressor, a combustor, gas turbine and the nozzles. In this engine 80 to 90% of the total propulsive thrust is generated by the gas turbine and the remainder is developed by the expansion of the gases in nozzles. Due to this the power generated in the gas turbine is used for driving the compressor and the propeller, while in case of turbojet engines the turbine power is only used to drive the compressor and the auxiliaries. The gas turbine drives the propeller through the reduction gear unit and it draws a large amount of air. A large part of this air drawn by the propeller is passed through the ducts around the engine and the remainder is compressed in the diffuser by ram compression and further in the compressor. Fuel is burnt in the combustor and the resultant high temperature gases are expanded in the turbine and finally in the nozzles. The total thrust developed is the sum of thrust developed by the propeller and the nozzle. Unlike the turbojet engines the turboprop engines are widely used for commercial and military air crafts, due to their low specific fuel consumption and high flexibility of operation at reasonably high speed.  ----------

Que.No	Marks	
Q 6 e)	4	Question: **Explain any one method to improve thermal efficiency of gas turbine with the help of block diagram.** Answer: **Methods to improve thermal efficiency of gas turbine** **1) Regeneration** – This is done by preheating the compressed air before entering to the combustion chamber with the turbine exhaust in a heat exchanger, thus saving fuel consumption.  2) Improving turbine output: this can be done by **(a) Reheating**: The whole expansion in the turbine is achieved in two or more stages &reheating is done after each stage.  (b) Increasing the value of maximum cycle temp. (c) Improving turbine efficiency by improving design. **3. Reducing compressor input: By** **(a) Intercooling**: Compressor work is reduced by intercooling the air between the compressor stages. +  (b)By lowering inlet temp to compressor (c) By increasing compressor efficiency (d) Water injection at inlet to compressor ----------

Examination: 2016 WINTER

Que.No	Marks	
Q 3 b)	4	Question: **Compare closed cycle and open cycle gas turbine.** Answer: Open cycle and closed cycle gas turbines Any four differences

Sr.no	Factors	Open cycle gas turbine	Closed cycle gas turbine
1.	**Pressure**	Lesser pressure	Higher pressure
2.	**Size of the plant for given output**	Larger size	Reduced size
3.	**Output**	Lesser output	Greater output
4.	**Corrosion of turbine blades**	Corrosion takes place due to contaminated gases	No corrosion since there is indirect heating.
5.	**Working medium**	Loss of working medium	No loss of working medium.
6.	**Filtration of incoming air**	It may cause severe problem.	No filtration of air is required.
7.	**Part load efficiency**	Less part load efficiency	More part load efficiency
8.	**Thermal efficiency**	Less thermal efficiency	More thermal efficiency
9.	**Requirement of cooling water**	No Requirement of cooling water	Larger amount of cooling water required
10.	**Weight of system for given power**	Less	More
11.	**Response to the changing load**	Good response	Poor response
12.	**Fluid friction**	More Fluid friction	Less Fluid friction

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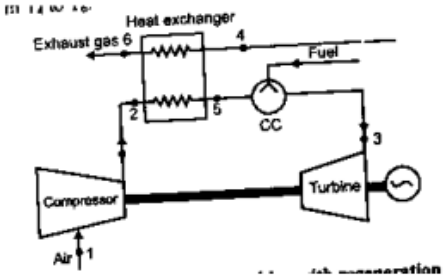
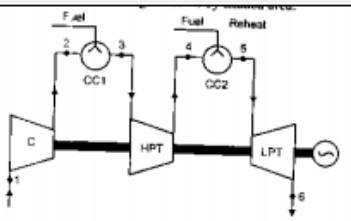
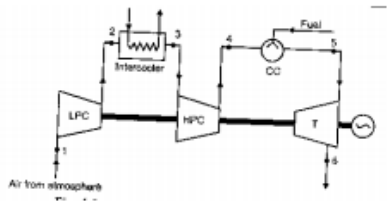
Que.No	Marks	
Q 4a)(d)	4	Question: **State different methods for improving thermal efficiency of gas turbine and explain any one.** Answer: **Methods to improve thermal efficiency of gas turbine** [illegible] of any one – 2 marks) **1) Regeneration** – This is done by preheating the compressed air before entering to the combustion chamber with the turbine exhaust in a heat exchanger, thus saving fuel consumption.  **2) Improving turbine output: this can be done by** **(a) Reheating :** The whole expansion in the turbine is achieved in two or more stages &reheating is done after each stage.  **(b) Increasing the value of maximum cycle temp.** **(c) Improving turbine efficiency by improving design.** **3. Reducing compressor input: By** **(a) Intercooling** : Compressor work is reduced by intercooling the air between the compressor stages.  (b)By lowering inlet temp to compressor (c) By increasing compressor efficiency (d) Water injection at inlet to compressor

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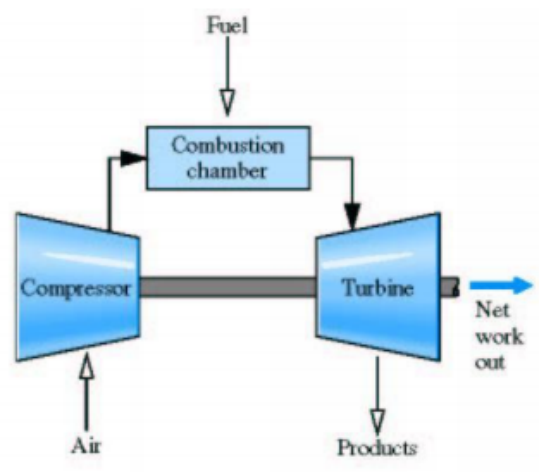
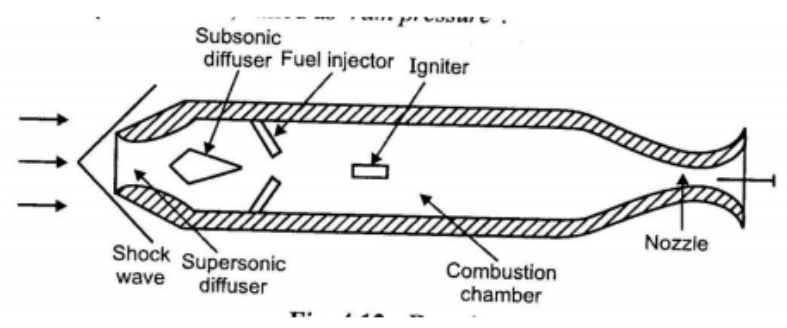
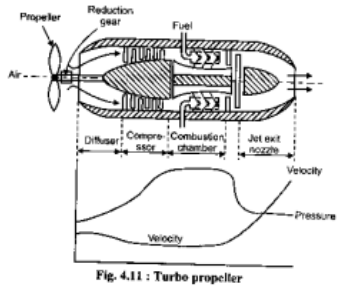
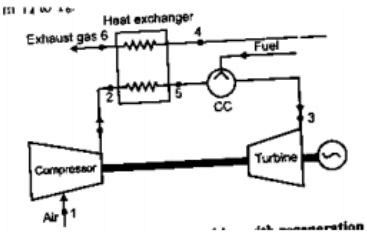
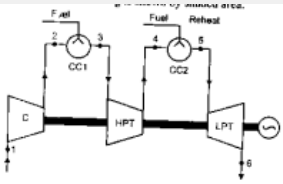
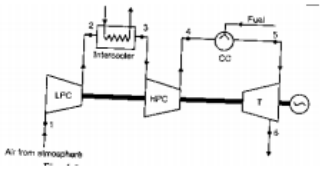
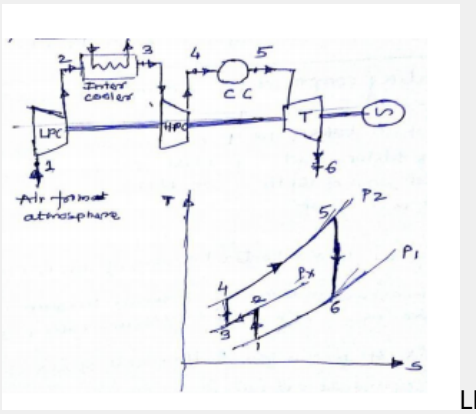
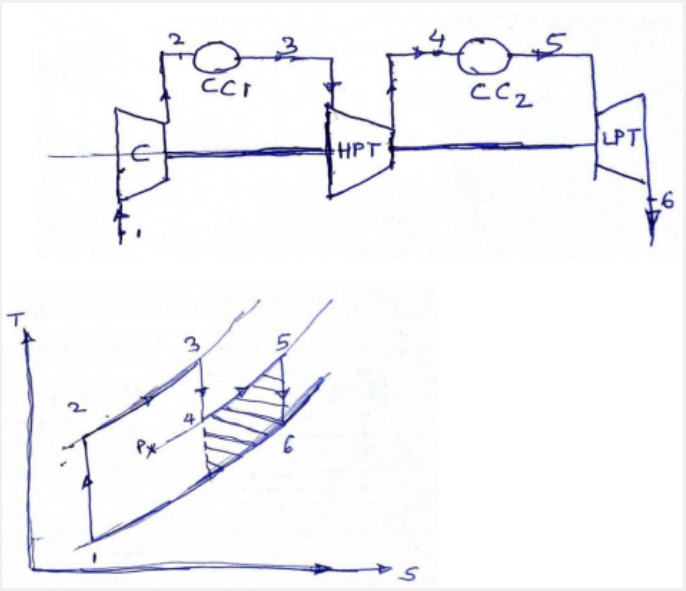
Que.No	Marks	
Q 5 c)	8	Question: **Explain with neat sketch construction and working of constant volume gas turbine.** Answer: Constant volume gas turbine Working:- Air from surrounding atmosphere is drawn in compressor and is compressed to a pressure of about 3 kN/m2 . The compressed air is then admitted to the combustion chamber through the inlet valve. When inlet valve is closed, the fuel oil is admitted by means of a separate fuel pump into combustion chamber containing compressed air. The mixture (of air and fuel oil) is then ignited by an electric spark, the pressure rising to about 12 kN/m2 , whilst the volume remains constant. Thus combustion takes place at constant volume.  ----------

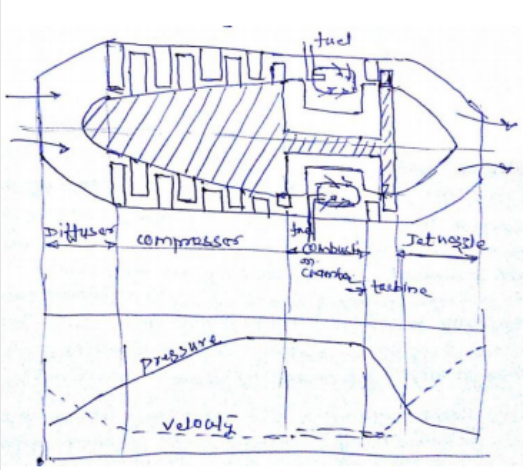
Que.No	Marks	
Q 6 d)	4	Question: **Explain the principle of Ram jet with neat sketch** Answer: Ram jet – (Fig – 2 marks ; explanation –2 marks) - Ram jet is also called as 'Athodyd or flying stove pipe'. - It is a steady combustion or continuous flow engine & has the simplest construction of any propulsion engine. - Consist of inlet diffuser, combustion chamber & exit nozzle. - Air entering into ram jet with supersonic speed is slowed down to sonic speed in supersonic diffuser, increasing air pressure. - The air pressure is further increased in the subsonic diffuser. - The fuel injected into the combustion chamber is burned with the help of flame stabilizers. The high temp & high pressure gases are passed through the nozzle converting the pressure energy into kinetic energy. - It is not self operating at zero flight velocity. It requires launching rockets.  ----------

Examination: 2015 SUMMER

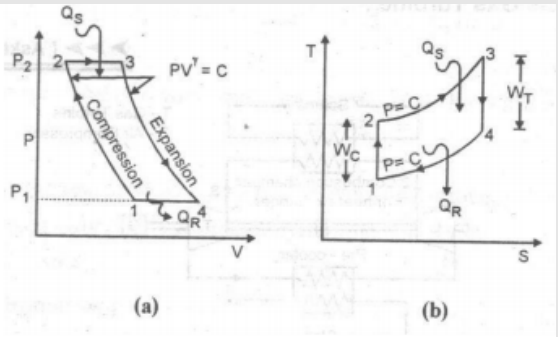
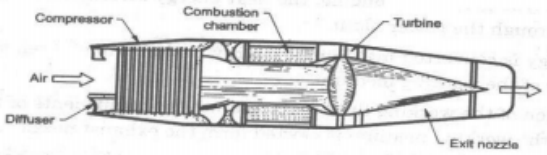
Que.No	Marks	
Q 3 d)	4	Question: **Explain with a neat sketch turbo propeller w.r.to Jet propulsion** Answer: **(d) Turbopropellar : (sketch -2, explaination – 2 marks)**  **Fig. 4.11 : Turbo propeller** -In turboprop engine propeller is present. - The turbine is designed so that it develops shaft power for driving a propeller to provide most of the propulsive thrust, and only a small amount thrust is provided by jet. - In this case, nearly 80 to 90% of the power propulsion is generated by turbine & is transmitted to the propeller through reduction gear. The remaining 10 to 20% of the thrust is developed by expanding the turbin exhaust in a nozzle of suitable design. - The turboprop combines in it the merits of turbojet engine and propeller i. e. Low specific weight, small frontal area, simplicity, lower vibrations, high power for the take off and high propulsive efficiency at high speed. ----------

Que.No	Marks	
Q 4 c)	4	Question: **What are the methods to improve thermal efficiency of gas turbine ? Explain any one method.** Answer: **1) Regeneration** – This is done by preheating the compressed air before entering to the combustion chamber with the turbine exhaust in a heat exchanger, thus saving fuel consumption.  **2) Improving turbine output: this can be done by** **(a) Reheating** : The whole expansion in the turbine is achieved in two or more stages &reheating is done after each stage.  **(b) Increasing the value of maximum cycle temp.** **(c) Improving turbine efficiency by improving design.** **3. Reducing compressor input: By** **(a) Intercooling** : Compressor work is reduced by intercooling the air between the compressor stages.  (b)By lowering inlet temp to compressor (c) By increasing compressor efficiency (d) Water injection at inlet to compressor ---
Q 4 d)	4	Question: **What is jet propulsion ? Give the classification of jet propulsion system.** Answer: Jet Propulsion: This is done by expanding the gas which is at high temperature & pressure through the nozzle so that the gas with very high velocity leaves the nozzle giving thrust in opposite direction. - Principle is based on Newton's Second & third law of motion. Jet propulsion – Classification (1) Atmospheric jet engines (breathing engine) -Turbojet engine - Turbo prop engines - Ram jet (2) Rocket engine (Non - breathing engine) ---

Que.No	Marks	
		Question: **Explain intercooling and reheating in gas turbine with the help of T-S diagram.** Answer:  LPC – LOW pressure cylinder HPC – high pressure cylinder CC – combustion chamber T – Turbine (2+ 2 marks) The net work of gas turbine cycle may be increased by saving some compression work. This is done by using several stages of compression with inter cooling of air between stages. The air from first stage of compression is cooled in inter cooler approximately to its initial temperature before entering to second stage of compressor. The effect of inter cooling is to decrease the network and increase the efficiency as compared to the simple ideal cycle without inter cooling. The ideal open gas turbine with inter cooling can be shown as 1 – 2 – 3 – 4 – 5 – 6 In first stage compressor atmospheric air is compressed from P1 to P2, it is them cooled from temperature T2 to T3 = T1 in the inter cooler at constant inter mediate pressure Px and finally compressed from Px to P2 in second stage or compressor. ii) Gas turbine with reheatingCC – Combustion Chamber C – Compressor
Q 5 b)	8	 By reheating or adding heat to exhaust gases after have passed through a part of the rows of turbine balding (or stages), a further increase in work done obtained. In reheating, the gas temperature which has dropped due to expansion is brought back to approximately the initial temperature for expansion in next stage. Since the working fluid contains about 85% of air, additional fuel can be burnt by injecting it into the gases without any additional air supply. The reheat cycle can be shown as 1 – 2 – 3 – 4 – 5 – 6. The combustion gases from combustion chamber CC1 at temperature T3 is partially expanded in the HP turbine from P2 to intermediate pressure Px. After this, it is them passed through combustion chamber CC2 where it is reheated at constant pressure Px so that the temperature of gas is raised from T4 to T5. After this gas is expanded in second stage of turbine reheating is shown by shaded area ----------

Que.No	Marks	
Q 6 c)	4	Question: **Explain the working principle of jet propulsion with a neat sketch.** Answer: Working principle of jet propulsion - Jet propulsion is based on Newton's second law and third law's of motion. - Means producing forward axial thrust by means of reaction of jet of gases which are discharged rearward with a high velocity (aircraft, missile & submarine) - As applied to vehicle operating in fluid, a momentum is imparted to a mass of fluid in a such a manner that the reaction of imparted momentum furnishes a propulsive force. The magnitude of this propulsive force is termed as thrust. - For efficient production of large power, fuel is burnt in an atmospheric of compressed air combustion chamber, the product of combustion expanding first in gas turbine which drive the air compressor and second in nozzle from which thrust is desired for turbojet engine.  Turbojet consist of 1) Diffuser 2) Compressor 3) Combustion chamber 4) Turbine 5) Jet-nozzle. Function – Diffuser is to convert the K.E. or air into state pressure rise, air is compressed in compressor air is entered into combustion chamber where fuel is supplied and combustion take places at const. It expanded in urbine where drops or pressure & increased in velocity. After gases leaves the turbine, they further expanded in nozzle & its leaves with high velocity to produce forward thrust… ---

Examination: 2015 WINTER

Que.No	Marks	
Q 3 b)	4	Question: **Draw constant pressure closed cycle gas turbine on P.V and T-S planes. Name the various processes involved and give its efficiency equation with meaning of each term.** Answer:  Process 1-2 : Isentropic compression Process 2-3: Heat addition at constant pressure Process 3-4 : : Isentropic expansion Process 4-1: Heat rejection at constant pressure $\eta_{th} = 1 - \frac{1}{(R_p)^{\frac{\gamma-1}{\gamma}}}$ ----------
Q 5 c)	4	Question: **Explain construction and working of turbojet with neat labelled sketch** Answer: **Turbo-Jet Engine :**  **Turbo-jet engine** The turbojet engine consists of an open cycle gas turbine engine (compressor, combustion chamber and turbine) with an entrance air diffuser added in front of the compressor and an exit nozzle added rear end or aft of the turbine. In this unit no propeller is provided. The diffuser of a turbojet engine must provide the greatest possible pressure rise by slowing the incoming air and converting its kinetic energy into pressure. The shape, area and location of the actual air inlet in an aeroplane is highly important. Variable area entrance diffusers are being developed for new aircraft in order to maintain high diffuser efficiency for both high and low speed operation. The atmospheric air enters the compressor through the front opening. The compressor compresses the air to the required pressure and discharges it into combustion chamber. The fuel is injected into the combustion chamber at constant pressure. The gases leaving the combustion chamber expand in turbine, which produces sufficient power to run the compressor and exhaust to atmospheric through nozzle, which produces propulsive thrust to drive the unit. The major advantages of the use of axial flow compressor is capable of multistaging and small frontal area, out weight its sensitivity and fragility. Therefore it is the current choice for use in turbojet engine of high thrust output. ----------

<table>
<tr><th>Que.No</th><th>Marks</th><th></th></tr>
<tr><td>Q 6 e)</td><td>4</td><td>Question:
Compare, closed cycle and open cycle gas turbine (any four point)

Answer:
<table>
<tr><th>Sr.no</th><th>Factors</th><th>Open cycle gas turbine</th><th>Closed cycle gas turbine</th></tr>
<tr><td>1.</td><td>Pressure</td><td>Lesser pressure</td><td>Higher pressure</td></tr>
<tr><td>2.</td><td>Size of the plant for given</td><td>Larger size</td><td>Reduced size</td></tr>
<tr><td>3.</td><td>Output</td><td>Lesser output</td><td>Greater output</td></tr>
<tr><td>4.</td><td>Corrosion of turbine</td><td>Corrosion takes place due to</td><td>No corrosion since there is</td></tr>
<tr><td>5.</td><td>Working medium</td><td>Loss of working medium</td><td>No loss of working medium.</td></tr>
<tr><td>6.</td><td>Filtration of incoming air</td><td>It may cause severe problem.</td><td>No filtration of air is required.</td></tr>
<tr><td>7.</td><td>Part load efficiency</td><td>Less part load efficiency</td><td>More part load efficiency</td></tr>
<tr><td>8.</td><td>Thermal efficiency</td><td>Less thermal efficiency</td><td>More thermal efficiency</td></tr>
<tr><td>9.</td><td>Requirement of cooling</td><td>No Requirement of cooling water</td><td>Larger amount of cooling</td></tr>
<tr><td>10.</td><td>Weight of system for</td><td>Less</td><td>More</td></tr>
<tr><td>11.</td><td>Response to the changing</td><td>Good response</td><td>Poor response</td></tr>
<tr><td>12.</td><td>Fluid friction</td><td>More Fluid friction</td><td>Less Fluid friction</td></tr>
</table>
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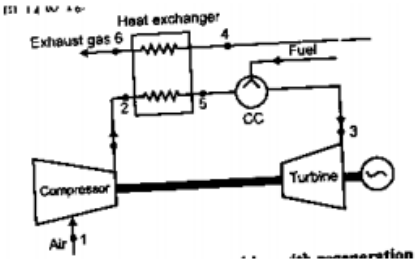
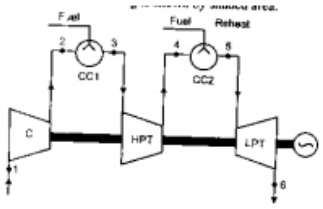
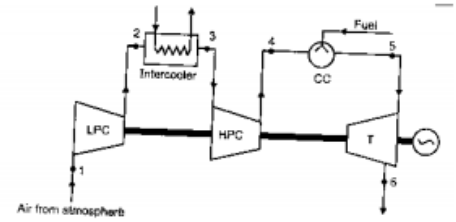
<tr><td>Q 6 f)</td><td>4</td><td>Question:
State the different methods used to improve thermal efficiency of gas turbine. Explain any one in brief.

Answer:
Methods to improve thermal efficiency of gas turbine 1) Regeneration – This is done by preheating the compressed air before entering to the combustion chamber with the turbine exhaust in a heat exchanger, thus saving fuel consumption.
 

(a) Reheating : The whole expansion in the turbine is achieved in two or more stages &reheating is done after each stage.
 

(a) Intercooling
 

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</table>

Examination: 2014 WINTER

<table>
<tr><th>Que.No</th><th>Marks</th><th></th></tr>
<tr><td>Q 3 b)</td><td>4</td><td>Question:
State merits/demerits of gas turbine over T.C. engine with respect to following parameters: (i) mechanical efficiency (ii) starting trouble (iii) weight per power (iv) part load thermal efficiency.

Answer:
<table>
<tr><th>Sr. No.</th><th>Parameters</th><th>Gas Turbine</th><th>I.C. Engine</th></tr>
<tr><td>1</td><td>Mechanical Efficiency</td><td>High due to absence of reciprocating parts</td><td>Low due to large number of reciprocating parts</td></tr>
<tr><td>2</td><td>Starting Trouble</td><td>Starting of gas turbine is difficult and needs complex arrangements</td><td>Starting of I. C. Engine is simple</td></tr>
<tr><td>3</td><td>Weight to power ratio</td><td>The weight of gas turbine per kW power developed is low since the working pressures are low requiring lighter construction</td><td>The weight of I.C. engine per kW power developed is high since the working pressures are high requiring heavy construction</td></tr>
<tr><td>4</td><td>Part load thermal efficiency</td><td>Part load thermal efficiency is poor and it is less efficient</td><td>They are efficient and part load thermal efficiency is high</td></tr>
</table>
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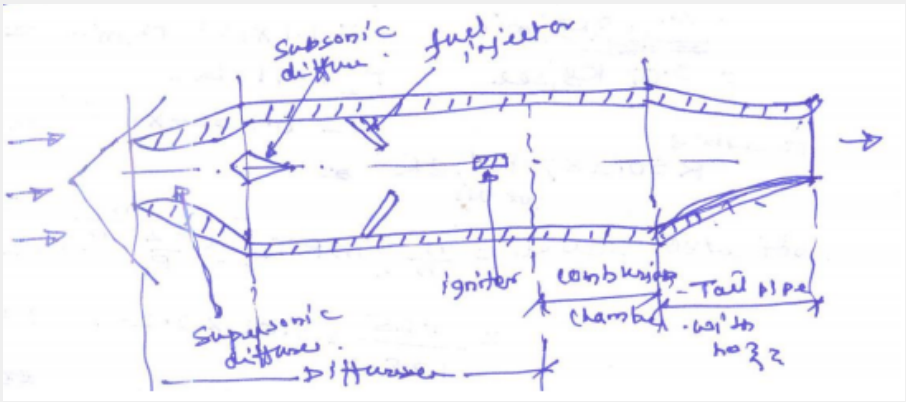
<tr><td>Q 5 c)</td><td>8</td><td>Question:
Explain the construction and working of Ram jet with the help of neat labelled schematic diagram. State its limitations (any two).

Answer:
 

Ramjet – it consist of inlet difference, combustion chamber and tail pipe (exist nozzle) Ramjet has no compressor as the entire compression depends upon compression. Function of supersonic & subsonic difference to convert the kinetic called the ram pressure. Working:- The air entering into ram jet with sup sonic speed is slowed down to sonic velocity in the air pressure is further increase in the sup sonic different increasing also the temperature of air. The diffuser section is designed to get correct ram effect its into decrees the velocity & increase pressure of in cooling air. The duel injected into combustion chamber is burned with help of igniter the high tress engine temperature garb are passed through the nozzle converting into pressure energy into kind energy. The high velocity gas leaving the nozzle provide required toward thrust to ramjet. Limitation 1. Ramjet engine be launched from an air plane flight. 2. Fuel consumption is too large. The fuel consumption lower decrees flight need.
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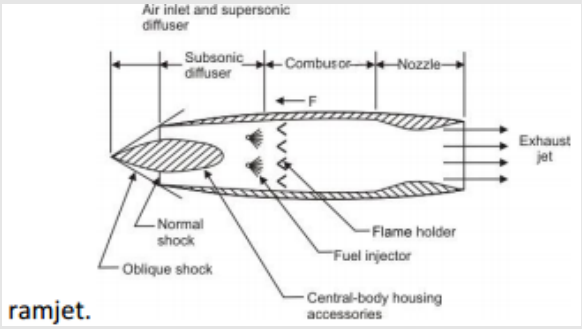
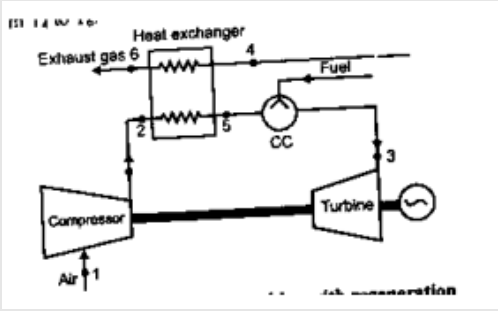
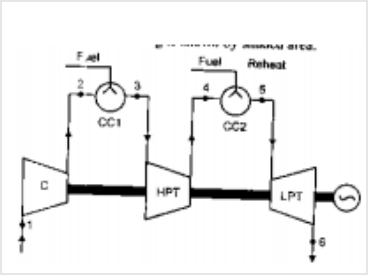
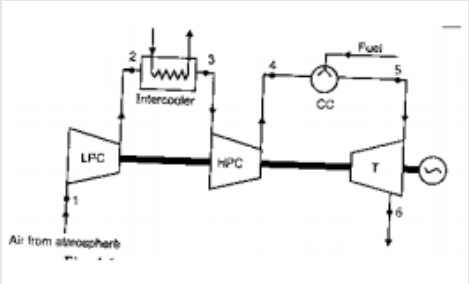
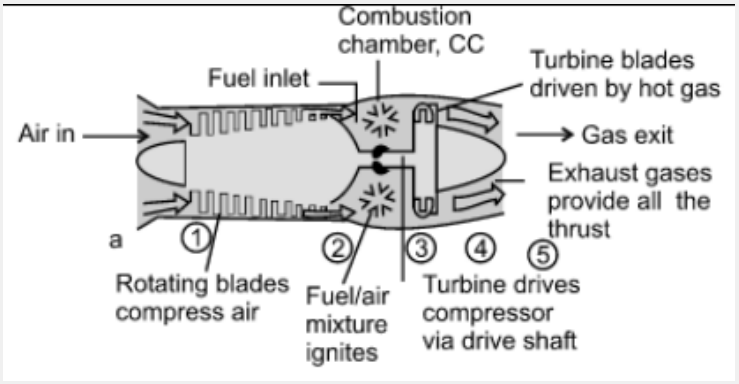
</table>

Examination: 2018 SUMMER

Que.No	Marks	
Q 3 d)	4	Question: **Explain with neat sketch working principle of Ram jet engine** Answer: Ramjet has no compressor as the entire compression depends upon compression. Function of supersonic & subsonic difference to convert the kinetic called the ram pressure. **Working:-** The air entering into ram jet with supersonic speed is slowed down to sonic velocity in the supersonic diffuser ,increasing air pressure. The air pressure is further increase in the subsonic diffuser increasing also the temperature of air. The diffuser section is designed to get correct ram effect. it's job is to decrease the velocity & increase pressure of incoming air. The fuel injected into combustion chamber is burned with help of flame igniter. The high pressure and high temperature gases are passed through the nozzle converting into pressure energy into kinetic energy. The high velocity gas leaving the nozzle provide required toward thrust to.  ----------
Q 4 d)	4	Question: **State advantages of jet propulsion over other systems.** Answer: **Advantages of jet propulsion –** 1. Higher mechanical efficiency due to absence of reciprocating parts. 2. The weight of gas turbine per kW power developed is low since the working pressures are low requiring lighter construction. 3. Can produce much more power at much higher altitudes where drag is less so higher speeds are possible and they are more efficient. 4. Reliability is one of the elements of success for jet engines. They only have a couple of moving parts and almost no vibration. ----------

Que.No	Marks	
Q 5 b)	8	Question: **List the methods to improve thermal efficiency of gas turbine and explain any one of them in detail** Answer: **Methods to improve thermal efficiency of gas turbine** **1) Regeneration** – This is done by preheating the compressed air before entering to the combustion chamber with the turbine exhaust in a heat exchanger, thus saving fuel consumption.  **2) Reheating** : The whole expansion in the turbine is achieved in two or more stages & reheating is done after each stage. That increase in work done.  **3) Intercooling** –The compression is performed in two or more stages. But between two stage there is intercooler where cooling takes place at constant pressure.To increase net work of gas turbine by saving some compression work.  ----------

Que.No	Marks	
Q 6 c)	4	Question: **Explain with neat sketch working principle of turbo jet engine.** Answer: **Working principle of Turbojet:** shows the schematic of turbojet engine. It has a diffuser section at inlet for realizing some compression of air passing through this section. Due to this air reaching compressor section has pressure more than ambient pressure. This action of partly compressing air by passing it through diffuser section is called “ramming action” or “ram effect”. Subsequently compressor section compresses air which is fed to combustion chamber and fuel is added to it for causing combustion. Combustion products available at high pressure and temperature are then passed through turbine and expanded there. Thus, turbine yields positive work which is used for driving compressor. Expanding gases leaving turbine are passed through exit nozzle where it is further expanded and results in high velocity jet at exit. This high velocity jet leaving nozzle is responsible for getting desired thrust for propulsion.  ----------