

Subject Code.....

ROLL NO.....

**SEMESTER EXAMINATION 2022-23**

**1<sup>st</sup> year M.Tech. Thermal Engineering**

**Gas Turbine and Jet Propulsion (TET-306)**

**Duration : 3 hrs**

**Max. Marks: 100**

**Note:- Attempt all questions. All question carry equal marks. In case any ambiguity or missing data, the same may be assumed and state the assumption made in the answer.**

<b>Q.1.</b>	<b>Answer any four parts of the following.</b>	<b>5×4=20</b>
	<ul style="list-style-type: none"><li>a) Explain with neat sketch the working operators of air standard Brayton cycle.</li><li>b) Sketch the neat diagram of regenerative gas turbine plant and deduce an expression for its thermal efficiency.</li><li>c) Explain the various efficiencies associated with a propulsion device.</li><li>d) With aid of suitable schematic diagram, explain the working principle of Ram Jet engine and mention the various advantages and disadvantages of Ram jet engine compared to other.</li><li>e) Explain the requirements of a liquid propellant and its advantages over solid propellant rockets.</li><li>f) Explain the need of Cryogenics in propulsion systems.</li></ul>	
<b>Q.2.</b>	<b>Answer any four parts of the following.</b>	<b>5×4=20</b>
	<ul style="list-style-type: none"><li>a) What is meant by staging? Explain why multi-staging is required.</li><li>b) List the advantages of closed cycle gas turbine system over open cycle system.</li><li>c) State the difference between air breathing and non -air breathing propulsion systems.</li><li>d) Explain the significance of intercooler. What is meant by perfect intercooling?</li><li>e) Define isothermal efficiency of the compressor and prove that the isothermal work input to a compressor is always minimum.</li><li>f) A Brayton cycle works between 1 bar, 300 K and 5 bar, 1250 K. There are two stages of compression with perfect intercooling and two stages of expansion. The work out of first expansion stage being used to drive two compressors, where the inter stage pressure is optimized for the compressor. The air from the first stage turbine is again heated to 1250 K and expanded. Calculate the power output of free power turbine and cycle efficiency without and with heat exchanger and compare them. Also calculate improvement in the efficiency.</li></ul>	
<b>Q.3.</b>	<b>Attempt any two parts of the following.</b>	<b>10×2=20</b>

	<p>a) Write different components of a centrifugal compressor and explain the working principle of each component. Calculate the work done by the compressor from velocity triangles.</p> <p>b)</p>	
<b>Q.4.</b>	<b>Attempt any two parts of the following.</b>	<b>10×2=20</b>
	a)	
<b>Q.5.</b>	<b>Attempt any two parts of the following.</b>	<b>10×2=20</b>
	<p>a) Write different components of a radial flow turbine and explain its working principle. Calculate the specific work output from the velocity triangles.</p>	