Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VIII • EXAMINATION – SUMMER 2014

Subject Code: 181904 **Date: 29-05-2014**

Subject Name: Thermal Engineering

Time: 10:30 am TO 01:00 pm **Total Marks: 70**

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**
4. **Use of properties tables is permitted.**

Q.1	**(a)**	Define Nozzle. Also describe the effects of friction on performance of the steam nozzle with h-s diagram.	**07**
	(b)	Write detailed classification of Steam Turbines.	**07**
Q.2	**(a)**	What are assumptions are to be made while analyzing the Brayton cycle. Also derive the equation of Thermal Efficiency for it.	**07**
	(b)	A nozzle is supplied with steam at 15 bar and 250^0 C with negligible velocity and it leaves the nozzle at 1.2 bar pressure. There are 10 % friction losses throughout the passage of the nozzle. Determine the maximum mass flow rate and the exit diameter if the throat diameter is 0.8 cm.	**07**
		OR	
	(b)	In a reaction turbine, the fixed blades and moving blades are of same shape but reverse in direction. The angles of the receiving tips are 35^0 and of the discharging tips 20^0. Find the power developed per pair of blades for a steam consumption of 2.5 kg/s, when the blade speed is 50 m/s. If the heat drop per pair is 10.04 kJ/kg, find the efficiency of the pair.	**07**
Q.3	**(a)**	Draw the diagrammatic arrangement of velocity compounded impulse turbine. Also write merits and demerits of velocity compounding of it.	**07**
	(b)	Derive condition of maximum blade efficiency in case of 50% reaction turbine	**07**
		OR	
Q.3	**(a)**	Explain working of Back pressure turbine with figure. Also give its economic assessment.	**07**
	(b)	Describe various requirements of a typical combustion chamber of the gas turbine plant.	**07**
Q.4	**(a)**	Explain Thrust, Thrust Power and Propulsive Power in context to jet propulsion.	**07**
	(b)	A gas turbine installations works on Brayton cycle between the temperature limits of 35^0 C and 715^0 C. For the maximum work to be developed, calculate temperature at the end of compression, pressure ratio and thermal efficiency.	**07**
		OR	
Q.4	**(a)**	Explain different methods to improve the thermal efficiency of a Gas Turbine plant with T-s diagram.	**07**
	(b)	A turbojet engine propels at a speed of 880 km/hr and draws air at the rate of 50 kg/s. isentropic enthalpy drop in the nozzle is 190 kJ/kg and its velocity coefficient is 0.96. Fuel air ratio used is 0.010. The C.V. of fuel used is 46000 kJ/kg and the combustion efficiency is 95 %. Find Thrust, Thrust Power, Thrust SFC and Propulsive Power.	**07**

Q.5	**(a)**	List different methods of governing of steam turbines. Explain any one of them.	**07**
	(b)	Derive equation for maximum mass flow rate of steam through nozzle.	**07**

OR

Q.5	**(a)**	Draw schematic diagram of Pulse Jet. Also write merits and demerits of it.	**07**
	(b)	Explain construction and working of typical combined cycle power plant with figure.	**07**

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