

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° 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° and of the discharging tips 20°. 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° C and 715° 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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