

GUJARAT TECHNOLOGICAL UNIVERSITY
PDDC - SEMESTER-VIII • EXAMINATION – WINTER • 2014

Subject Code: X 81901**Date: 28-11-2014****Subject Name: Thermal Engineering****Time: 02:30 pm - 05:00 pm****Total Marks: 70****Instructions:**

- 1. Attempt all questions.**
- 2. Make suitable assumptions wherever necessary.**
- 3. Use of steam table and Moiler chart is permitted.**
- 4. Figures to the right indicate full marks.**

- Q.1** (a) Give classification of steam turbine and explain any one type of steam turbine. **07**
(b) What do you mean by compounding of steam turbine ? Enlist the different methods for it. Draw a neat sketch for any one. **07**
- Q.2** (a) Derive an expression for mass flow rate of steam through nozzle. **07**
(b) Steam is expanded in a nozzle from 10bar and 350°C to 1 bar. For the super heated steam and neglecting initial velocity of steam calculate: **07**
(1) Critical pressure
(2) Velocity at throat
(3) Velocity at exit
- OR**
- (b) Write a short note on : Governing of steam turbine **07**
- Q.3** (a) Explain the various methods of attachment of blades to turbine rotor. **07**
(b) Discuss the various losses in steam turbine **07**
- OR**
- Q.3** (a) Explain Parson's reaction turbine. Why it is called 50% reaction turbine. **07**
(b) The outlet angle of the blade of a Parson's reaction turbine is 20° and axial velocity of flow of steam is 0.5 times the mean blade velocity. Mass flow rate of steam is 1 kg/min. If the diameter of ring is 2.0 meter and rotational speed is 2400 r.p.m. determine: **07**
(1) Inlet angles of blades
(2) Power developed
- Q.4** (a) Explain Back pressure and Pass out turbine **07**
(b) Explain regenerative cycle with neat sketch. **07**
- OR**
- Q.4** (a) What is the principle of jet propulsion ? Explain turbo pop engine. **07**
(b) Explain Ram jet with T-S diagram **07**
- Q.5** (a) State the classification of gas turbine and explain with neat sketch working of closed cycle gas turbine. **07**

- (b) A gas turbine unit has a pressure ratio of 5:1 and maximum cycle temperature of 500°C. The isentropic efficiencies of the compressor and turbine are 0.82 and 0.82 respectively. Air enters the compressor at 25°C at the rate of 1 kg/s. Take $C_p = 1.005$ kJ/kg and $\gamma = 1.4$ for compression process, and $C_p = 1.11$ kJ/kg and $\gamma = 1.3$ for expansion process. Determine : 07
- (1) Compressor work input
 - (2) Turbine work output
 - (3) Net work out put

OR

- Q.5 (a)** For an impulse turbine, explain the following terms and also obtained expression for them 07
- (1) Power
 - (2) Axial thrust
 - (3) Blade efficiency
- (b) A single stage impulse turbine has a mean blade speed is 220 m/sec and blade speed ratio is 0.5 and discharge is axial. The nozzle angle is 16° and blade friction factor is 0.92. Determine : 07
- (1) Blade angles at inlet and outlet
 - (2) Theoretical power per kg of steam
