Seat No.: _____ Enrolment No._____

# GUJARAT TECHNOLOGICAL UNIVERSITY

**PDDC - SEMESTER–VIII • EXAMINATION – SUMMER • 2015**

**Subject Code:X 81901** **Date: 07/05/2015**

**Subject Name: Thermal Engineering**

**Time:10:30 am - 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.**

**Q.1** **(a)** Derive an expression for mass flow rate of steam through nozzle **07**

**(b)** The throat diameter of round section of nozzle is 8 mm. Steam with initial pressure of 10 bar and 250°C of temperature is to be expanded down to a back pressure of 1.0 bar. Determine : **07**

1. Velocity at throat
2. Velocity at exit
3. Flow rate of steam
4. Size of Divergent

**Q.2** **(a)** Give classification of steam turbine and explain any one type of steam turbine. **07**

**(b)** Write a short note on : Governing of steam turbine **07**

**OR**

**(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.3** **(a)** Explain Parson's reaction turbine. Why it is called 50% reaction turbine **07**

**(b)** Parson's reaction turbine which has the following particulars: **07**

1. Speed=1500 rpm
2. Mean diameter of rotor=1meter
3. Stage efficiency = 80%
4. Speed ratio=0.7
5. Blade outlet angle=20°

Determine the isentropic enthalpy drop in the stage.

**OR**

**Q.3** **(a)** Define the following : **07**

1. Speed ratio
2. Blade velocity coefficient
3. Nozzle efficiency.

**(b)** Define blade efficiency and hence derive an expression for maximum blade efficiency for a single stage impulse steam turbine. **07**

**Q.4** **(a)** Discuss briefly the methods employed for improvement of thermal efficiency for an open cycle gas turbine plant. **07**

**(b)** The air enters the compressor of an open cycle constant pressure gas turbine at a pressure of 1 bar and temperature of 25°C. The pressure of air after compression is 5 bar. The isentropic efficiencies for compressor and turbines are 80% and 82% respectively .The air fuel ratio used is 90:1, flow rate of air is 3.0 kg/sec . Calorofic value of fuel=41800 kJ/kg.Calculate **07**

1. Exit temperature from compressor
2. Exit temperature from turbine
3. Net work developed
4. Power developed

**OR**

**Q.4** **(a)** State the fundamental difference between the jet propulsion and rocket propulsion. **07**

**(b)** Explain the working difference between propeller-jet, turbo-jet and turbo-prop. **07**

**Q.5** **(a)** Explain reheat cycle with neat sketch. **07**

**(b)** Explain regenerative cycle with neat sketch. **07**

**OR**

**Q.5** **(a)** Explain the various methods of attachment of blades to turbine rotor. **07**

**(b)** Explain various losses in steam turbine **07**