Seat No.: _____ Enrolment No.

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VIII (OLD) EXAMINATION – WINTER 2018

Subject Code: 181904 **Date: 03/12/2018**

Subject Name: Thermal Engineering

Time: 02:30 PM TO 05:00 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)** Define the term "steam nozzle" and state its application. Explain in brief various types of nozzles. **07**

(b) Explain the working of ramjet engine with a neat sketch and also state its applications. **07**

Q.2 **(a)** State the various methods of governing of steam turbines. Explain nozzle governing with neat sketch. **07**

(b) Explain in brief the various internal and external losses in steam turbines. **07**

OR

(b) In an air standard gas turbine engine, air at a temperature of 15^0C and a pressure of 1.01 bar enters the compressor, where it is compressed through a pressure ratio of 5. Air enters the turbine at a temperature of 815^0C and expands to original pressure of 1.01 bar. Determine the thermal efficiency and the ratio of turbine work to compressor work when the engine operates on an ideal Brayton cycle. Take $\gamma = 1.4$, $C_p = 1.005$ kJ/kg ^{0}K. **07**

Q.3 **(a)** Derive an expression for mass flow rate of steam through the nozzle in terms of initial pressure, initial specific volume, area of cross-section, final pressure and index "n". **07**

(b) Derive the expression for critical velocity in a nozzle in terms of local sonic velocity at inlet conditions and isentropic index of expansion. **07**

OR

Q.3 **(a)** Explain pressure compounded impulse steam turbine. State its advantages and disadvantages. **07**

(b) With schematic and T-S diagram explain gas turbine cycle with intercooling, regeneration and reheating. **07**

Q.4 **(a)** Define the terms with respect to steam turbine:- **07**
(i) Blade efficiency (ii) Blade speed ratio (iii) Work done (iv) Axial thrust (v) Stage efficiency (vi) Tangential force (vii) Carry over coefficient

(b) Write a short note on "Pulse Jet Engine". **07**

OR

Q.4 **(a)** With a neat sketch explain closed cycle gas turbine plant. What are the advantages of closed cycle over open cycle gas turbine plant? **07**

(b) Write a short note on "Turbo prop engine". **07**

Q.5 **(a)** Give a brief comparison of impulse and reaction steam turbines. **07**

(b) Define reheat factor and internal efficiency. Derive the relation between stage efficiency, internal efficiency and reheat factor. **07**

OR

Q.5 **(a)** State the merits and demerits of gas turbine over steam turbine. **07**

(b) Explain any three methods of blade fixation on the turbine rotor with neat sketch. **07**

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