Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VII(NEW) • EXAMINATION – WINTER 2016

Subject Code:2171917 **Date:01/12/2016**

Subject Name:Steam and Gas Turbines

Time:10.30 AM to 1.00 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)** Explain effect of operating variables on thermal efficiency of Gas turbine **07**

(b) Based on General relationship Between Area, Velocity & Pressure explain **07**

A. Acerbated flow dp/p is Negative (flow through nozzle)

B. Retorted flow dp/p is positive(flow through diffuser)

Q.2 **(a)** Derive an Equation of thermal efficiency & work-ratio of Ideal Brayton cycle **07**

(b) Derive condition for maximum discharge through the nozzle. **07**

OR

(b) Draw p-v &T-s diagram for gas turbine cycle with: (1) Intercooler, (2) Reheating & (3) Regeneration **07**

Q.3 **(a)** Draw & Explain: Pressure-Velocity compounding system of impulse turbine. **07**

(b) Steam leaves nozzles of De-Laval turbine with a velocity of 1150 m/s .the nozzle angle is 20° .The blades are symmetrical with blade angle of 30°. If blade velocity coefficient is 0.8 and Mechanical efficiency is 0.92. Calculate: (1) Speed of rotation if the rotor diameter is 75cm (2)Specific steam consumption in Kg/Kw-hr (3) Blade efficiency & Axial thrust. **07**

OR

Q.3 **(a)** Draw & Explain: Pulse-jet engine with applications **07**

(b) A simple Impulse turbine has a mean blade ring diameter of 75cm and run at 3000 RPM. The blade speed ratio is 0.46. and the discharge is axial the nozzle angle is 20° and blade friction is 0.94. **07**

Determine:

(1)Blade angles

(2)Theoretical specific power output.

Q.4 **(a)** Explain construction & working of Turbo-prop Engine. **07**

(b) Draw & Explain Can type combustor with swirl floe flame stabilizer **07**

OR

Q.4 **(a)** Write short note on Turbojet engine with Afterburner. **07**

(b) A gas turbine unit has a pressure ratio of 6:1 and maximum cycle temperature of 627° C .The isentropic efficiency of compressor and turbine are 0.82 & 0.85 respectively. Calculate the power output in KW of an electrical generator geared to the turbine when the air enters the compressor at 15° C , 1 bar pressure with flow rate of 18 Kg/sec. **07**

Q.5	**(a)**	Draw & Explain: Gas & Steam turbine combined cycle power plant	**07**
	(b)	A dry saturated steam enter steam nozzle at pressure of 15 bar and is discharge to a pressure of 2 bar .If the dryness fraction of discharge steam is 0.86. What will be the final velocity of steam? Neglected initial velocity. If 10% heat is loss due to friction then what is the final reduction in velocity ratio.	**07**

OR

Q.5	**(a)**	What is governing of steam turbine? Explain "Throttle governing	**07**
	(b)	A C-D nozzle is to be discharge in which steam is initially at 14 bar & 80°C of superheated is to be expand to back pressure of 1.05 bar .Determine the necessary throat & Exit diameter of a nozzle for steam discharge of 500 Kg/hr. Assuming that expansion of steam is thermal equilibrium throughout and friction reheat amount of total isentropic enthalpy drop to be effective in divergent part of nozzle.	**07**

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