Seat No.: _____ Enrolment No.

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VIII(NEW) EXAMINATION – SUMMER 2019

Subject Code:2181928 **Date:17/05/2019**

Subject Name:Steam and Gas Turbines

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.**

Q.1	**(a)**	Describe different types of nozzle with neat sketch.	**03**
	(b)	Compare open cycle and closed cycle gas turbine.	**04**
	(c)	What do you mean by compounding of steam turbine? Explain velocity Compounded impulse turbine.	**07**
Q.2	**(a)**	Explain basic working principle of jet propulsion with neat sketch.	**03**
	(b)	Enlist advantages and disadvantages of gas turbine power plant.	**04**
	(c)	In a De Laval turbine steam issues from the nozzle with a velocity of 1200 m/s. The nozzle angle is 20˚, the mean blade velocity is 400 m/s, and the inlet and outlet angles of blades are equal. The mass of steam flowing through the turbine per hour is 1000 kg. Calculate: (i) Blade angles. (ii) Relative velocity of steam entering the blades. (iii) Power developed. (iv) Tangential force on the blades. (v) Blade efficiency. Take blade velocity co-efficient as 0.8	**07**
		OR	
	(c)	A nozzle expands steam from 12 bar and 250˚C to 6 bar. Neglecting the initial velocity, find the minimum area of the nozzles to flow 2 kg/s of steam under the given conditions. Assume the expansion of steam is isentropic. Calculate the actual throat area if the coefficient of discharge is 0.98.	**07**
Q.3	**(a)**	Enlist the method of attachment of blades to turbine rotor.	**03**
	(b)	Derive the equation of efficiency for ideal Brayton cycle.	**04**
	(c)	Derive an expression for maximum discharge through a nozzle.	**07**
		OR	
Q.3	**(a)**	Explain various losses in steam turbine.	**03**
	(b)	Explain with neat sketch Nozzle governing for steam turbine.	**04**
	(c)	A gas turbine unit has a pressure ratio of 6 : 1 and maximum cycle temperature of 610˚C. The isentropic efficiencies of the compressor and turbine are 0.80 and 0.82 respectively. Calculate the power output in kilowatts of an electric generator geared to the turbine when the air enters the compressor at 15˚C at the rate of 16 kg/s. Take c_p = 1.005 kJ/kg K and γ = 1.4 for the compression process, and take c_p = 1.11 kJ/kg K and γ = 1.333 for the expansion process.	**07**
Q.4	**(a)**	State the classification of gas turbine power plant.	**03**
	(b)	Derive velocity of steam flowing through a nozzle.	**04**
	(c)	Explain with neat sketch working of combined steam and gas turbine power plant.	**07**
		OR	
Q.4	**(a)**	State the effect of super saturation flow in nozzle.	**03**

	(b)	Draw neat sketch of can type combustor with swirl flow flame stabilizer.	**04**
	(c)	Explain back pressure turbines with neat sketch.	**07**
Q.5	**(a)**	Define: (i) Blade efficiency and (ii) Stage efficiency.	**03**
	(b)	Differentiate impulse turbine and reaction turbine.	**04**
	(c)	Explain working of Turbojet engine with neat sketch.	**07**

OR

Q.5	**(a)**	State the difference between rocket engine and jet engine.	**03**
	(b)	Explain ramjet engine.	**04**
	(c)	Enlist the methods employed for improvement of thermal efficiency of open cycle gas turbine plant. Explain any one with neat sketch.	**07**

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