GUJARAT TECHNOLOGICAL UNIVERSITY
BE- SEMESTER–VIII (NEW) EXAMINATION – WINTER 2020

Subject Code:2181928   **Date:28/01/2021**
Subject Name:Steam and Gas Turbines
Time:02:00 PM TO 04:00 PM   **Total Marks: 56**

Instructions:
1. **Attempt any FOUR questions out of EIGHT questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**
4. **Use of steam table is permitted.**

			MARKS
Q.1	**(a)**	Explain the functions of convergent portion, divergent portion and throat with reference to flow of steam.	**03**
	(b)	Enlist different losses in steam turbine.	**04**
	(c)	Derive expression for mass flow rate through the nozzle.	**07**
Q.2	**(a)**	What are the main types of gas turbine combustion chamber?	**03**
	(b)	State and Draw different types of steam nozzle with neat sketch.	**04**
	(c)	Estimate the mass flow rate of steam in a nozzle with the following data: Inlet pressure and temperature =14 bar and 210°C Back Pressure = 1.2bar Throat Diameter =12mm	**07**
Q.3	**(a)**	Give importance of combined cycle power plant.	**03**
	(b)	Draw p-v &T-s diagram for gas turbine cycle with: (1) Intercooler, (2) Reheating	**04**
	(c)	Explain physical significance of critical ratio.	**07**
Q.4	**(a)**	Give application of gas turbine.	**03**
	(b)	In a stage of an impulse turbine provided with a single row wheel, the mean diameter of the blade ring is 780 mm and speed of rotation is 3200rpm. The steam issues from the nozzles with a velocity of 305m/s and nozzle angle is 21˚. The rotor blades are equiangular and the blade friction factor is 0.88. What is power developed in the blading when axial thrust on the blades is 145 newtons?	**04**
	(c)	Explain with neat sketch various method of attachment of blade to turbine rotor.	**07**
Q.5	**(a)**	Draw Can -type combustor with swirl flow flame stabilizer	**03**
	(b)	Write short note on labyrinth packing.	**04**
	(c)	What is principle of jet propulsion? State advantages and disadvantages of jet propulsion.	**07**
Q.6	**(a)**	Define thrust power and propulsive efficiency.	**03**
	(b)	Write short note on Turbojet engine.	**04**
	(c)	Explain throttle governing of steam turbine with neat sketch.	**07**
Q.7	**(a)**	How does energy conservation take place in steam turbine?	**03**
	(b)	Give difference between impulse and reaction turbines	**04**
	(c)	In an open cycle gas turbine plant air at 18˚C and 1.013bar is compressed through pressure ratio 5:1. The maximum temperature	**07**

in the cycle is 820 °C and gas expands in two turbine stages to the original pressure, with reheating at constant pressure of 2.265 bar to 820 °C between the stages. The air is compressed in two stages, with complete intercooling, division being made for optimum conditions. The isentropic efficiencies of the compressors and turbines are 0.88 and 0.92 respectively determine (1) power for mass flow of 22kg/s (2) overall thermal efficiency. (3) Air fuel ratio. Assume cp=1.005 kj/kg.K and calorific value of 41600kJ/kg

Q.8	(a)	Explain work ratio for ideal brayton cycle	03
	(b)	Draw and label Ram jet engine.	04
	(c)	Air at 9 bar and 170°C expands through a convergent-divergent nozzle in to a space at 1.03bar. The flow rate of air is 3.2kg/s. assuming isentropic flow throughout and neglecting the inlet velocity, calculate throat and exit areas of the nozzles.	07

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