

GUJARAT TECHNOLOGICAL UNIVERSITY

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

Subject Code: 2181928

Date: 29/11/2018

Subject Name: Steam and Gas Turbines

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.
4. Use of steam table is permitted.

		MARKS
Q.1	(a) Give detailed classification of steam turbines.	03
	(b) Explain basic working principle of Gas turbine.	04
	(c) What is principle of jet propulsion? State advantages and disadvantages of jet propulsion.	07
Q.2	(a) Enlist different losses in gas turbine.	03
	(b) State and Draw different types of steam nozzle with neat sketch.	04
	(c) Explain the working of turbojet engine with neat sketch.	07
	OR	
	(c) Derive an expression for maximum blade efficiency for a single stage impulse steam turbine.	07
Q.3	(a) List different requirements of a typical combustion chamber of the gas turbine power plant.	03
	(b) Give detailed classification of steam turbines.	04
	(c) Explain throttle governing of steam turbine with neat sketch.	07
	OR	
Q.3	(a) Give classification of propulsive engine.	03
	(b) Give difference between impulse and reaction turbines	04
	(c) Explain with neat sketch working of steam and gas combined cycle power plant. Give advantages of combined cycle power plant	07
Q.4	(a) Explain working of pulse jet engine.	03
	(b) Draw and label Ram jet engine.	04
	(c) Derive condition for maximum discharge through the nozzle.	07
	OR	
Q.4	(a) How does energy conservation take place in steam turbine?	03
	(b) In a stage of an impulse turbine provided with a single row wheel, the mean diameter of the blade ring is 800 mm and speed of rotation is 3000rpm. The steam issues from the nozzles with a velocity of 300m/s and nozzle angle is 20°. The rotor blades are equiangular and the blade friction factor is 0.86. What is power developed in the blading when axial thrust on the blades is 140 newtons?	04
	(c) Air at 7.8bar and 180°C expands through a convergent-divergent nozzle in to a space at 1.03bar. The flow rate of air is 3.6kg/s. assuming isentropic flow throughout and neglecting the inlet velocity, calculate throat and exit areas of the nozzles.	07
Q.5	(a) List various operating variables which affect the work ratio in gas turbine power plant.	03
	(b) What are the main types of gas turbine combustion chamber?	04

- (c) In an open cycle gas turbine plant air at 15°C and 1.013bar is compressed through pressure ratio 5:1. The maximum temperature in the cycle is 800°C and gas expands in two turbine stages to the original pressure, with reheating at constant pressure of 2.265bar to 800°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 0.8 and 0.9 respectively determine (1) power for mass flow of 20kg/s (2) overall thermal efficiency. (3) Air fuel ratio. Assume $c_p=1.005\text{kJ/kg.K}$ and calorific value of 41800kJ/kg

OR

- Q.5** (a) Write short note on labyrinth packing. **03**
(b) Derive an Equation of thermal efficiency of Ideal Brayton cycle **04**
(c) Draw p-v & T-s diagram for gas turbine cycle with: (1) Intercooler, **07**
(2) Reheating & (3) Regeneration

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