Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

PDDC - SEMESTER–VIII EXAMINATION – SUMMER 2016

Subject Code:X81901 **Date:10/05/2016**

Subject Name:Thermal Engineering

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)**	Steam at a pressure of 10 bar and 0.9 dry discharge through a nozzle having throat area of 45 mm^2. If the back pressure is 1 bar, find (1) Final velocity of the steam and (2) Cross sectional area of nozzle at the exit for maximum discharge.	**07**
	(b)	The velocity of steam, leaving the nozzles of an impulse turbine, is 1200 m/s and the nozzle angle is 20^0, the blade velocity is 375 m/s and the blade velocity co-efficient is 0.75. assuming no loss due to shock at inlet, calculate for a mass flow of 0.5 kg/sec and symmetrical blading (1) blade inlet angle (2) driving force on the wheel (3) axial thrust on the wheel and (4) power developed by the turbine	**07**
Q.2	**(a)**	A gas turbine plant with a pressure ratio of 1:5 takes in air at 15^0c. The maximum temperature is 600^0c and develops 2200 kw. The turbine and compressor efficiency are 0.85. Take c_p=1 kj/kg k and c_v=0.714 kj/kg k. Find (1) actual overall efficiency and (2) mass of air circulated by the turbine	**07**
	(b)	Explain principle of jet propulsion and give its classification.	**07**
		OR	
	(b)	In a four stage impulse turbine, the steam is supplied at 350^0c and at a pressure of 20 bar. The exhaust pressure is 0.05bar and the overall efficiency is 80%. Assuming that the work is shared equally between the stages and the condition line to be straight. Determine (1) stage steam pressure (2) efficiency of each stage and (3) reheat factor	**07**
Q-3	**(a)**	What is critical pressure? Derive the expression of critical pressure ratio to have maximum mass flow for a nozzle.	**07**
	(b)	Explain parson's reaction turbine. Why it is called 50% reaction turbine?	**07**
		OR	
Q.3	**(a)**	Explain general relationship between area, velocity and pressure in nozzle flow.	**07**
	(b)	What do you understand by compounding of steam turbine? Explain velocity compounded impulse steam turbine.	**07**
Q.4	**(a)**	Derive equation of thermal efficiency for simple gas turbine working as per joule cycle.	**07**
	(b)	Explain any four losses in steam turbine.	**07**
		OR	
Q.4	**(a)**	What are major field of application of gas turbine. Draw layout of close cycle gas turbine with inter cooling, reheating and regeneration.	**07**
	(b)	Derive an expression for mass flow rate of steam through the nozzle.	**07**

Q.5	**(a)**	For an impulse turbine explain following terms and also obtain expression for them (1) power (2) axial thrust (3) blade efficiency.	**07**
	(b)	Explain open cycle gas turbine with inter cooling. Derive equation of thermal efficiency for same.	**07**

OR

Q.5	**(a)**	Explain throttle governing with neat sketch.	**07**
	(b)	Give comparison of open cycle and closed cycle gas turbine.	**07**