Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

PDDC - SEMESTER–I • EXAMINATION – WINTER • 2014

Subject Code: X11902 Date: 23-12-2014

Subject Name: Engineering Thermodynamics

Time: 10:30 am - 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.**
4. **Use of steam table is permitted**

Q.1	**(a)**	In a steam power cycle, the steam supply is at 15 bar and dry and saturated. The condenser pressure is 0.4 bar. Calculate the carnot and rankine efficiency of the cycle. Neglect pump work.	**07**
	(b)	Explain clausius inequality.	**07**
Q.2	**(a)**	Prove that internal energy is a point function and work is a path function.	**07**
	(b)	In an oil engine working on duel combustion cycle has a compression ratio 14 and explosion ratio obtain from indicator card is 1.4. If the cut off occurs at 6 percent of stroke, find the ideal efficiency. Take Υ=1.4	**07**
		OR	
	(b)	Derive equation of air standard efficiency of diesel cycle.	**07**
Q.3	**(a)**	Derive steady flow energy equation for condenser and nozzle.	**07**
	(b)	In air standard otto cycle the pressure at the end of compression is 15 times higher than that at the start, the temperature of air at the beginning of compression is 38^0c and maximum temperature attained in the cycle is 1950^0c. Determine compression ratio, thermal efficiency and workdone of the cycle.	**07**
		OR	
Q.3	**(a)**	In an air compressor air flows steadily at the rate of 0.5 kg/s through an compressor. It enters the compressor at 6 m/s with a pressure of 1 bar and a specific volume of 0.85 m^3/kg and leaves at 5 m/s with a pressure of 7 bar and a specific volume of 0.16 m^3/kg. the internal energy of air leaving is 90 kj/kg greater than that of the air entering. Cooling water in a jacket surrounding the cylinder absorbs heat from the air at the rate of 60 kj/s. calculate the power required to drive the compressor.	**07**
	(b)	Derive equation of air standard efficiency of otto cycle.	**07**
Q.4	**(a)**	Explain available energy referred to a cycle.	**07**
	(b)	15 kg of water is heated in an insulated tank by a churning process from 300 k to 340 k. if the surrounding temperature is 300 k; find the loss in availability for the process.	**07**
		OR	
Q.4	**(a)**	Give limitation of first law of thermodynamics and explain statements of second law of thermodynamics	**07**
	(b)	Explain carnot's theorem	**07**
Q.5	**(a)**	Using Maxwell relations derive the clausius clapeyron equation.	**07**
	(b)	Explain bomb calorimeter.	**07**
		OR	
Q.5	**(a)**	Explain janker gas calorimeter.	**07**
	(b)	Derive an expression for availability of non flow process.	**07**

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