Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

ME – 2nd SEMESTER• EXAMINATION – WINTER 2015

Subject Code: 2722111 **Date: 11/12/ 2015**

Subject Name: Design and Optimization of Thermal System

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.**

Q.1	**(a)**	What is Engineering design? Explain "Design as part of engineering enterprise".	**07**
	(b)	What is the basic characteristics of thermal system? Why design of thermal system need optimization?	**07**
Q.2	**(a)**	Give design problem formulation process in detail.	**07**
	(b)	What are the basic considerations in design?	**07**
		OR	
	(b)	An air-conditioning system is to be designed for a residential building. The interior of the building is to be maintained at a temperature of 23 ± 4°C. The ambient temperature can go as high as 42°C and the rate of heat dissipated in the house is given as 2.2 kW. The location, geometry, and dimensions of the building are given. Formulate the design problem and give the problem statement.	**07**
Q.3	**(a)**	What are the importance of simulation? Explain numerical simulation versus real system?	**07**
	(b)	Explain with suitable example "merging of different model", "accuracy" and "validation".	**07**
		OR	
Q.3	**(a)**	List and explain various types of models and importance of modelling in design?	**07**
	(b)	Discuss steepest ascent and steepest descent method in detail.	**07**
Q.4	**(a)**	What are the importance of search method in optimization of thermal system? Give different types of search method and explain each in brief.	**07**
	(b)	List different Optimization methods and differentiate between search method and calculus methods.	**07**
		OR	
Q.4	**(a)**	Explain non-traditional optimization techniques in details.	**07**
	(b)	Consider solar thermal application where the hot water produced by a solar collector is kept in a cylindrical storage tank and it's used regulated so that it is also available at night time. The storage tank has a capacity of 4000litres.convective losses from the tank have to minimize. Ambient temperature and convection coefficient are constant. Solve this optimization problem using Lagrange multiplier method.	**07**
Q.5	**(a)**	How to affect economic factor in engineering design? Discuss application of economic consideration in Thermal system.	**07**

(b) An Automobile company acquires a warehouse facility for ₹2,50,00,000. It pays ₹70,00,000 as down payment on delivery of the facility and takes a loan for the remaining amount. This loan is to be paid in 10 years, with monthly payments starting at the end of the first month. The rate of interest is 10.5%, compounded monthly. Calculate the monthly payment. After 5 years, the financial situation of the company is much better and the company wants to pay off the loan. Calculate the amount it has to pay at the end of 5 years to take care of the remaining loan. **07**

OR

Q.5 **(a)** What is series of payments? How to raising capital fund? **07**

(b) In a food-processing system, the refrigeration and storage unit is to be purchased, A new unit can be obtained by paying ₹1,00,000 on delivery and 5 annual payments of ₹25,000 at the end of each year, starting at the end of the first year. A used and refurbished unit can be obtained by paying ₹60,000 at delivery and 10 annual payments of ₹20,000 at the end of each year. The salvage value of the new unit is ₹75,000 and that of the used one is ₹40,000, both being disposed of at the end of 10 years. The interest rate is 9.5 %, compounded annually. Which alternative is financially more attractive? **07**

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