

Roll No

MMTP-301(A)**M.E./M.Tech., III Semester**

Examination, June 2017

**Computer Aided Design of Thermal System
(Elective - I)****Time : Three Hours****Maximum Marks: 70**

- Note:** i) Solve any five questions.
 ii) All questions carry equal marks.
 iii) Draw neat diagrams wherever required.

1. a) Give conceptual design steps in design process.
 b) Formulate the design problem for the following manufacturing process, employing symbols for appropriate physical quantities.

Arc welding by means of an electrode moving at 5 cm/s and supplying 1000 W to join two metal plates, each of thickness 5 mm. See Figure 1(b).

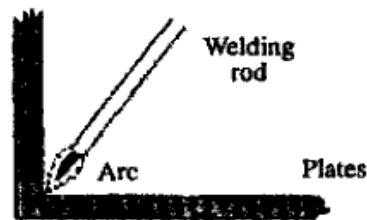


Figure 1(b)

2. A system for the storage of thermal energy is to be designed using an underground tank of water. The tank is buried at a depth of 3m and is a cube 1m on each side. The water in the tank is heated by circulating it through a solar energy collection system. A given heat input to the water may be

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assumed due to the solar energy flux. Characterize the design problem in terms of the fixed quantities and design variables.

3. a) State basic features of modelling. State types of models and their suitability.
 b) Give the governing equations and boundary conditions for the steady state, two-dimensional case for the preceding physical problem. Derive the governing dimensionless parameters using the non dimensionalization of the equations and the boundary conditions.
4. a) Give basics of thermal design of heat engine.
 b) A scaled-down version of a shell and tube heat exchanger is to be used to simulate the actual physical system to be used in a chemical plant. Determine the dimensionless parameters that must be kept the same in order to ensure similarity between the full-size and scaled-down systems.
5. a) Define the terms: Numerical Simulation. Write its importance and Different Classes.
 b) What are various Methods for Numerical Simulation? Discuss any one.
6. a) Write basic concepts of optimization in design. State important considerations in Optimization of Thermal Systems.
 b) A refrigeration system is to be designed to provide 5 kW of cooling at -5°C , with the ambient at 25°C . If the dimensions of the region that has to be cooled are fixed, list the design variables and requirements for an acceptable design. Suggest an objective function that may be employed for optimization. Also, give the constraints, if any, in the problem.

7. a) State importance of Search Methods in optimization.
b) Compare Linear Programming and Dynamic Programming.

8. Write short notes on following: (any two)
a) Development of a Numerical Model.
b) Numerical Simulation versus Real System.
c) Geometric Programming.
d) Knowledge-Based Systems.
