ME/Sem II/CBCS/Mech-Thermal/MATE/N-D-17

T7932 T8039 MODELLING AND ANALYSIS IN THERMAL ENGINEERING

Q P Code:13739

3 Hrs. **[Total Marks: 80]**

Note: 1. Answer any FOUR question.
2. Assume suitable additional data if necessary and draw the sketches wherever required.

Qu 1. a) What are the basic characteristics of thermal systems? [10]

Qu 1. b) Explain use of optimization in Fluid Flow Systems and equipment. [10]

Qu 2. a) What are various models used to characterize the nature of model? [10]

Qu 2. b) Why simulation is required in modelling of any system? Explain with one example. [10]

Qu 3. a) What are steps involved in the design and optimization of a thermal system and in the implementation of the design? [10]

Qu 3. b) An industrial system has three products whose outputs are represented by x, y, and z. These are described by the following three equations: [10]

$1.8x - 3.1y + 7.6z = 12.2$

$4.8x + 6y - 1.1z = 24.8$

$3.3x + 1.7y + 0.9z = 13.0$

i) Set up this system of equations for an iterative solution by any appropriate method, starting with an initial guess of $x = y = z = 0$.
ii) Do at least 3 iterative steps to obtain the solution to simulate the system.

Qu 4. a) Illustrate the methods used for numerical simulation? [10]

Qu 4. b) How to formulate the problems in terms of optimization?

Qu 5. a) What are the important features required for validation of the numerical simulation of the system by representing real system? [10]

Qu 5. b) In a manufacturing system, rectangular boxes of length x, height y, and width z (in meters) and open at the top, are used for storing and conveying material. The cost of material and fabrication is Rs. 9000/- per unit area in square meters, and the cost of storage varies inversely as the volume xyz, being 103 per unit volume in cubic meters. Formulate the optimization problem for minimizing the cost and obtain the optimum by using geometric programming. [10]

Qu 6. a) An engineering firm has to decide whether it should withdraw an investment that pays 8% interest, compounded monthly, and use it on a new product. It would undertake the new product if the real rate of increase in buying power from the current investment is less than 4%. The rate of inflation is given as 3.5%. Calculate the real rate of increase in buying power. Will the company decide to go for the new product? What should the yield from the investment be if the company wants a 5% rate of increase in buying power? [10]

Qu 6. b) What are artificial intelligence features involved in knowledge-based systems? [10]