R09

Code No: C7601

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

M.Tech I - Semester Examinations, March 2011

MATHEMATICAL MODELING

(AEROSPACE ENGINEERING)

Time: 3hours **Max. Marks: 60**

Answer any five questions

All questions carry equal marks

- - -

1. Discuss the following with examples:
   i) Order symbols: Big 'O' and Small 'o'
   ii) Asymptotic sequence and asymptotic expansion
   iii) Regular perturbation
   iv) Singular perturbation [3+3+3+3]

2. State variational principle. Derive Euler's equation for a variational extremum and apply it to find minimum distance between two points in a plane. [12]

3. Describe fourth-order Runge-Kutta approximation for a system of ordinary differential equations and discuss how to choose step size for desired accuracy in solving a given problem. [12]

4. Explain cellular automata model for a lattice gas and discuss through schematic diagrams how FHP rule operates in two dimensions on a triangular lattice. [12]

5. Define Discrete Fourier Transformation (DFT) and its corresponding inverse transform for N-dimensional data vector. Explain the logic involved in enhancing the computing speed of DFT by Fast Fourier Transform (FFT) [12]

6. Discuss with the help of a schematic diagram the steps involved in applying genetic algorithms for search and optimization problems. [12]

7. Describe a neural network with one hidden layer using a schematic diagram and discuss the steps involved in building a mathematical model using it [12]

8. Explain how extended Kalman filter is used for state estimation of non-linear systems given measurements of observable quantities. [12]

*****