

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

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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]
