

**STELLA MARIS COLLEGE (AUTONOMOUS) CHENNAI 600 086**  
**(For candidates admitted from the academic year 2009–10 & thereafter)**

**SUBJECT CODE: MT/PC/MM44**

**M. Sc. DEGREE EXAMINATION, APRIL 2012**  
**BRANCH I – MATHEMATICS**  
**FOURTH SEMESTER**

**COURSE : CORE**  
**PAPER : MATHEMATICAL MODELING**  
**TIME : 3 HOURS**

**MAX. MARKS : 100**

**Section – A**

**Answer any FIVE questions.**

**(5X8=40)**

1. Explain the conservation of energy and balance principles in Mathematical modeling.
2. Describe the scientific method of Mathematical modeling.
3. Discuss with an example the linearity in the context of geometrically similar objects.
4. In Birds and Flight model, explain the power available for Hovering.
5. By means of an example explain the validation of models by Algebraic Approximation.
6. Obtain the equation that cast the principal of conservation of cars under Macroscopic Traffic flow models.
7. Derive and discuss on Lotka- Volterra equation in Population growth model.

**Section – B**

**Answer any THREE questions.**

**(3X20=60)**

8. a) Discuss the principle of Mathematical modeling.  
b) Discuss the application of Buckingham  $\Pi$  theorem for Dimensional Analysis.
9. Explain in detail the Scaling and the design of experiments using a model of simple elastic beam of length L.
10. Define Taylor series of Trigonometric and Hyperbolic functions and find the approximation made in Taylor of Hyperbolic functions by means of an example.
11. Explain an elementary , Linear car- following Microscopic Traffic model.
12. Explain the Non-Linear model for a freely – vibrating Pendulum.

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