



**NATIONAL OPEN UNIVERSITY OF NIGERIA**  
**University Village, Plot 91, Cadastral Zone, Nnamdi Azikiwe Expressway, Jabi, Abuja.**

**FACULTY OF SCIENCES**  
**November, 2018 Examinations**

**Course Code:** MTH308  
**Course Title:** Introduction to Mathematical Modeling  
**Credit Unit:** 3  
**Time Allowed:** 3 HOURS  
**Instruction:** ATTEMPT NUMBER ONE (1) AND ANY OTHER FOUR (4) QUESTIONS

1. (a) (i) Define Mathematical modeling **(3 marks)**  
(ii) Formulate the dimensional formula for Elastic modulus. **(5 marks)**  
(ii) Mathematical models are basically of two kinds, discuss in brief these two kinds **(7 marks)**
- (b) Find  $T_0$  if  $\theta = 20^\circ$ , given that  $l = 20$  cm and  $g = 980$  cm/sec<sup>2</sup>. Use an appropriate Mathematical model with the usual notation **(7 marks)**
2. (a) Which type of modelling will you use for the launching of a rocket/satellite for meteorological purposes? **(5 marks)**  
(b) A raindrop, beginning at rest, falls from a cloud 705.6 m above the ground. How long does it take to reach the ground? **(7 marks)**
3. Explain the following:  
(i) Deterministic system **(3 marks)**  
(ii) Probabilistic system **(3 marks)**  
(b) State the dimensional formulae of the following:  
(i) Velocity **(1 ½ mark)**  
(ii) Acceleration **(1 ½ mark)**  
(iii) Force **(1 ½ mark)**  
(iv) Work **(1 ½ mark)**

- 4 (a) Explain in brief the following three main stages involved in the mathematical modeling of real life situation
- (i) Formulation of the mathematical equivalent (Model) **(4 marks)**
  - (ii) Obtaining a mathematical solution **(2 marks)**
  - (iii) Interpreting the solution in terms of the situation and validating the solution. **(2 marks)**
- (b) Given two or more different adequate models, discuss in brief two factors that can be used to rank them towards picking the best **(4 marks)**
5. (a) Explain briefly the following processes in Mathematical Modeling
- (i) Validation of a model **(3 marks)**
  - (ii) Interpretation of the solution of a model **(3 marks)**
- (b) Interpret the solution obtained in the formulations of the model of a simple pendulum **(6 marks)**
6. Explain briefly the following general steps in developing a model
- (i) Establish a Main Purpose for the model **(3 marks)**
  - (ii) Observe the Real Life Situation and understand what is going on **(3 marks)**
  - (iii) Sift the Essentials from the Non-Essentials of the problem **(3 marks)**
  - (iv) The Search for Essentials of the Problem is related to the main purpose of the model. **(3 marks)**