



NATIONAL OPEN UNIVERSITY OF NIGERIA

University Village, Plot 91, Cadastral Zone, Nnamdi Azikwe Express Way, Jabi-Abuja

FACULTY OF SCIENCES

Department of Mathematics

2021 Examinations ...

Course Code: MTH308

Course Title: Introduction to Mathematical Modeling

Credit Unit: 3

Time Allowed: 3 Hours

Total: 70 Marks

Instruction: Answer Question One (1) and Any Other 4 Questions

1. (a) Define the term Mathematical Modeling. **(5 marks)**
(b) With a well labelled diagram, discuss the modeling process. **(7 marks)**
(c) Differentiate between the following:
 - i. Linear and Non-linear model **(5 marks)**
 - ii. Deterministic and Scholastic model **(5 marks)**

2. (a) State and discuss the steps involved in identifying the essentials of a problem. **(5 marks)**
(b) A raindrop beginning at rest, falls from a cloud 705.6m above the ground. How long does it take to reach the ground? **(7 marks)**

3. (a) List and discuss two specific reasons for Mathematical Modeling. **(5 marks)**
(b) Water enters a cylindrical tank at a constant rate, a hole at the bottom of the tank allows water to escape at a rate proportional to $V^{2/3}$, where $V(t)$ is the volume of water at any time t . Write

out a differential equation describing the process and compute the equilibrium volume.
(7marks)

4. (a) Give three real life problems that can be modeled using mathematical modeling. **(5 marks)**

(b) Distinguish between a closed system and open system. **(7marks)**

5. (a) Mention and discuss two limitations of mathematical model. **(5 marks)**

(b) Differentiate between Empirical and Theoretical model. **(7 marks)**

6. (a) Which type of modelling will you use for the launching of a rocket/satellite for meteorological purposes?

(5 marks)

(b) How would you model Speed and Velocity? **(7 marks)**