



**NATIONAL OPEN UNIVERSITY OF NIGERIA**

**Plot 91, Cadastral Zone, Nnamdi Azikiwe Expressway, Jabi, Abuja.**

**FACULTY OF SCIENCES**

**April /May Examination 2019**

**Course Code: MTH308**  
**Course Title: Introduction to Mathematical Modeling**  
**Credit Unit: 3**  
**Time Allowed: 3 HOURS**  
**Total: 70 Marks**  
**Instruction: ATTEMPT NUMBER ONE (1) AND ANY OTHER FOUR (4) QUESTIONS**

1. (a) (i) What is Mathematical Modeling? (2.5 marks)  
(ii) Explain 1 (a) (i) with the help of a diagram. (4 marks)  
(b) List and explain two specific reasons (motivation) for Mathematical Modeling. (5marks)  
(c) Explain with example the following types of Mathematical Modeling  
(i) Linear Models (3.5 marks)  
(ii) Deterministic Models (3.5 marks)  
(iii) Stochastic Models (3.5 marks)
- 2.. (a) (i) Define the term; Mathematical Model (3 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  $V^{\frac{2}{3}}$  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. (9 marks)
3. (a) Give three examples of real life problems that can be solved with Mathematical Modeling. (3 marks)  
(b) Define the following terms with examples; (i) Dynamic Model (3 marks)  
(ii) Static Model (3 marks)  
(iii) Continuous Model (3 marks)
4. (a) Distinguish between a closed system and an open system. (7 marks)  
(b).Mention two limitations of Mathematical Model (5 mark)
5. (a) List and explain three general steps in developing a Mathematical Modeling (9 marks)

(b) Mention two factors that will help you decide the best if you are given three different models and briefly discuss any of the two factors. (3 marks)

6. (a). A raindrop beginning at rest, falls from a cloud 705.6m above the ground. How long does it take to reach the ground? ( 8 marks)

(b) Distinguish between Empirical models and Theoretical models (4 marks)