



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

**FACULTY OF SCIENCES**  
**DEPARTMENT OF MATHEMATICS**

**September Examination 2020**

**Course Code: MTH 308**

**Course Title: Introduction to Mathematical Modelling**

**Credit Unit: 3**

**Time Allowed: 3 Hours**

**Instruction: Answer Question Number One and Any Other Four Questions**

- 1a. Define Mathematical Modelling and briefly explain its modeling processes. **(6 marks)**
- b. Explain the following types of Mathematical model:
- i. Linear or Non Linear
  - ii. Static or Dynamic
  - iii. Discrete or Continuous
  - iv. Deterministic or stochastic **(6 marks)**
- c. Give a mathematical expression for each of the following types of behavior
- i. A linear form
  - ii. Growing without limit
  - iii. Increasing to a limit
  - iv. Decaying to a limit.. **(6marks)**
- d. Which type of modelling will you use for the launching of a rocket/satellite for meteorological purposes? **(4marks)**
- 2a.. Enumerate and explain two kinds of Mathematical models. **(6marks)**
- b. How can we formulate the dynamic stability of market equilibrium? **(6marks)**
3. In a room the floor of which is merely divided by parallel lines. A stick is thrown upwards, what is the probability that the stick will intersect a line. **(12marks)**
- 4a. A raindrop, beginning at rest, falls from a cloud 705.6 m above the ground. How long does it take to reach the ground? **(6marks)**
- b. Find  $T_0$  if  $q_0 = 20^0$ , given that  $l = 20$  cm and  $g = 980$  cm/sec<sup>2</sup> **(6marks)**

5. In general, consider the system  $x'' + rx' + w^2x = 0$ . Find the general solution. Discuss the behavior of this system under the following situations. (i).  $r > 2w$  (ii).  $r = 2w$  and (iii).  $r < 2w$ . **(12marks)**
- 6a. Explains the various steps involved in developing the model. **(8marks)**
- b. How would you model speed and velocity? **(4marks)**