



NATIONAL OPEN UNIVERSITY OF NIGERIA
University Village, Plot 91, Cadastral Zone, Nnamdi Azikwe Express Way, Jabi-Abuja
FACULTY OF SCIENCES
DEPARTMENT OF MATHEMATICS
2025_2 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 3 Questions

- 1 **a.** What is mathematical modelling? **(5 marks)**
 b. In formulation of a mathematical model what are the three factors to consider, and explain them **(10 marks)**
 c. State and discuss two limitations of mathematical modeling. **(10 marks)**
- 2 **a.** What are Empirical Models? **(4 marks)**
 b. i. What are theoretical models? **(5 marks)**
 ii. Differentiate between Linear and Non-linear models **(6 marks)**
- 3 **a.** Which types of modelling will you use for the launching of a rocket/satellite for meteorological purposes? **(5 marks)**
 b. Give two situations where mathematical treatment of problem is necessary to get the required solution. **(5 marks)**
 c. Using Elliptic Integral, find T_0 if $\theta_0 = 20^\circ$, given that $l = 20cm$ and $g = 980cm/sec^2$. **(5 marks)**
- 4 **a.** What is static Analysis? **(7 marks)**
 b. Find the terminal velocity of a drizzle drop with diameter $D = 0.01$ cm. Compare it to the terminal velocity of a fog droplet with one third of that diameter. **(8 marks)**
- 5 **a.** For a rain drop of diameter $D = 0.24$ cm, find the terminal velocity. Also find how long it takes to reach the ground if it starts its descent in a cloud 4000 meter high. **(7 marks)**
 b. Which type of modelling will you use for the launching of a rocket/satellite for meteorological purposes? **(8 marks)**
- 6 **a.** Solve $\frac{dn}{dt} = \lambda N$ **(5 marks)**
 b. Define the following:
 i. Supply of a commodity **(2 marks)**
 ii. Production lag **(3 marks)**
 iii. The demand for a commodity **(5 marks)**