



**JOMO KENYATTA UNIVERSITY  
OF  
AGRICULTURE AND TECHNOLOGY**

**EXAMINATION FOR THE BACHELOR OF SCIENCE IN COMPUTER  
SCIENCE  
YEAR II SEMESTER II**

**ICS 2207 SCIENTIFIC COMPUTING**

**Due Date: 12<sup>th</sup> April 2024 [25 Marks]**

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- a) Briefly explain the advantages of using NumPy arrays over Python lists for numerical computations. Highlight the concept of vectorization and how it contributes to NumPy's efficiency. [5 marks]
  
- b) Write a Python function using NumPy to calculate the dot product of two vectors. The function should accept two lists of numbers as input, convert them into NumPy arrays, and return the dot product. Include error handling for cases with mismatched input list lengths. [10 marks]
  
- c) Describe the use and importance of the pandas library in data analysis. Explain how DataFrame objects in pandas can be used to manage and analyze large datasets effectively, providing examples of data manipulation techniques such as filtering, grouping, and merging. [5 marks]
  
- d) Explain why symbolic computation is vital in scientific computing. [5 marks]