



Kasarani Campus  
Off Thika Road  
Tel. 2042692 / 3  
P. O. Box 49274, 00100  
NAIROBI  
Westlands Campus  
Pamstech House  
Woodvale Grove  
Tel. 4442212  
Fax: 4444175

**KIRIRI WOMEN'S UNIVERSITY OF SCIENCE AND TECHNOLOGY**  
**UNIVERSITY EXAMINATION, 2024/2025 ACADEMIC YEAR**  
**SECOND YEAR, FIRST SEMESTER EXAMINATION**  
**FOR THE BACHELOR OF BUSINESS AND INFORMATION TECHNOLOGY**  
**KBI 2201 – COMPUTER ARCHTECTURE AND OPERATING SYSTEMS**

Date: 09<sup>TH</sup> December 2024

Time: 2:30PM – 4:30PM

**INSTRUCTIONS TO CANDIDATES**

**ANSWER QUESTION ONE (COMPULSORY) AND ANY OTHER TWO QUESTIONS**

**QUESTION ONE (30 MARKS)**

QuantumOS is a cutting-edge operating system developed for high-performance computing applications, prioritizing efficiency and security. The development team at Quantum Tech is dedicated to refining various components of the operating system, which include process and thread management, advanced scheduling algorithms, robust file system management, and enhanced security protocols.

- Discuss the interaction between threads and processes in QuantumOS, highlighting their significance for system performance. (4 Marks)
- Compare and contrast preemptive and non-preemptive scheduling strategies employed by QuantumOS, providing examples of scenarios where each is beneficial. (6 Marks)
- Identify and explain three primary responsibilities of the kernel in QuantumOS and their impact on system functionality. (6 Marks)
- QuantumOS utilizes different process scheduling algorithms based on priority. Describe any four of these algorithms, including their operational principles and use cases. (8 Marks)
- Explore three key functions that QuantumOS performs as an operating system, emphasizing their importance in managing system resources. (3 Marks)
- Identify and explain three techniques that QuantumOS could implement to address deadlocks after they occur, discussing the pros and cons of each technique. (3 Marks)

**QUESTION TWO (20 MARKS)**

The Operating Systems development team is focused on enhancing process scheduling algorithms and improving system security.

- Compare the round-robin scheduling algorithm with the first-come, first-serve algorithm, discussing their respective advantages and disadvantages in the context of OS. (4 Marks)
- Identify and explain four potential conditions that could lead to deadlock during process execution in OS, along with examples for each. (8 Marks)
- Modern operating systems can be categorized based on their interaction styles. List and describe four relevant classes of operating systems applicable to OS. (4 Marks)
- Discuss at least three major security threats that could impact OS and outline corresponding protective measures for each threat. (4 Marks)

### **QUESTION THREE (20 MARKS)**

- a) Describe five key activities that NCBA BankOS is responsible for regarding file system management, including how these activities contribute to overall system performance. (4 Marks)
- b) Outline the different process states that a process can enter during its lifecycle in NCBA Bank OS, and discuss how transitions between these states occur. (8 Marks)
- c) Explain the two primary models of inter-process communication (IPC) used by NCBA Bank OS, detailing their characteristics and applications in system design. (8 Marks)

### **QUESTION FOUR (20 MARKS)**

- a) Identify and describe two core responsibilities of the kernel in managing system resources in operating systems. (4 Marks)
- b) Analyze the four main characteristics of the first-come, first-served (FCFS) scheduling algorithm, including its implications for system performance. (8 Marks)
- c) Discuss four key responsibilities of operating systems in file system management, emphasizing their importance in data integrity and access efficiency. (8 Marks)

### **QUESTION FIVE (20 MARKS)**

- a) Explain how buffering enhances the performance of Data Centre Operating Systems, including the specific mechanisms involved in buffering. (4 Marks)
- b) Identify and discuss four different types of scheduling algorithms used in Data Centre Operating Systems for prioritizing process execution. Provide examples where applicable. (8 Marks)
- c) Describe the roles of various scheduling algorithms in Data Centre Operating Systems, emphasizing how they contribute to system efficiency and user experience. (8 Marks)