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KIRIRI WOMENS' UNIVERSITY OF SCIENCE AND TECHNOLOGY
UNIVERSITY EXAMINATIONS, 2024/2025 ACADEMIC YEAR
END OF SEMESTER EXAMINATIONS
FOR THE DEGREE OF BACHELOR OF SCIENCE IN COMPUTER SCIENCE
KCS 2202 COMPUTER OPERATING SYSTEM

Date: AUGUST 2024
Time:

INSTRUCTIONS TO CANDIDATES
ANSWER QUESTION ONE (COMPULSORY) AND ANY OTHER TWO QUESTION

QUESTION ONE: COMPULSORY (30 MARKS)

SysPro Operating Systems is an advanced operating system designed for high-performance computing environments. The development team at SysPro Inc. is focused on optimizing various aspects of the operating system, including process and thread management, scheduling strategies, file system management, and security.

Scenario
Threads and Processes: Understanding the relationship between threads and processes is crucial for improving system performance and resource utilization.
Scheduling Strategies: SysPro OS employs various scheduling strategies to manage process execution efficiently. The team is evaluating the benefits of preemptive and non-preemptive scheduling.
Kernel Tasks: The kernel performs several essential tasks that are critical to the functioning of SysPro OS.
Process Scheduling Algorithms: The OS uses different algorithms to schedule processes based on priorities, aiming to enhance responsiveness and throughput.
Operating System Roles: The OS plays multiple roles in managing system resources and providing a user-friendly environment.
Deadlock Handling: Deadlocks can severely impact system performance. The team is exploring strategies to handle and prevent deadlocks.

a) Explain the relationship between threads and processes in SysPro OS.   **(4 Marks)**
b) Describe the key differences between preemptive and non-preemptive scheduling strategies used in SysPro OS.   **(6 Marks)**
c) Outline three main tasks performed by the kernel in SysPro OS.   **(6 Marks)**
d) SysPro OS performs process scheduling based on priorities using different algorithms. Explain any four of these algorithms.   **(8 Marks)**
e) Discuss three roles an operating system performs in any computer system, specifically in the context of SysPro OS.   **(3 Marks)**

f) State and explain three strategies that can be used to remove a deadlock after its occurrence in SysPro OS.   **(3 Marks)**

QUESTION TWO: (20 MARKS)

The KWUST Operating Systems development team is dedicated to enhancing process scheduling algorithms and improving system security. They are particularly focused on evaluating different scheduling algorithms and addressing potential security threats.

a) Analyse why the round-robin algorithm is considered better than the first-come, first-serve algorithm in KWUST OS. **(4 Marks)**

b) Explain four conditions that may cause a deadlock during process execution in KWUST OS. **(8 Marks)**

c) The classes of modern operating systems can be classified by the nature of interaction between the computer and the user. State and explain any four classes of operating systems relevant to KWUST OS. **(4 Marks)**

d) Discuss some security threats in KWUST OS and explain their respective protections. **(4 Marks)**

QUESTION THREE: (20 MARKS)

Efficient file system management and understanding process states are key to the smooth operation of KREP Bank OS. The ICT Staff is focusing on optimizing these aspects to ensure robust performance.

a) Explain five activities that KREP Bank OS is responsible for in file system management. **(4 Marks)**

b) Discuss different process states that change as a process is being executed in KREP Bank OS. **(8 Marks)**

c) Describe the two models of inter-process communication managed by KREP Bank OS. **(8 Marks)**

QUESTION FOUR: (20 MARKS)

The kernel is the core component of OS, performing various tasks to manage system resources effectively. The development team is also exploring the characteristics of different scheduling algorithms.

a) Outline two main tasks performed by the kernel in Operating Systems. **(4 Marks)**

b) Explain four characteristics of the first-come, first-served scheduling algorithm in Operating Systems. **(8 Marks)**

c) Discuss four various activities Operating Systems is responsible for in file system management. **(8 Marks)**

QUESTION FIVE: (20 MARKS)

Buffering techniques and efficient scheduling algorithms are vital for enhancing the performance of Data Centre Operating Systems. The development team is focusing on these areas to ensure optimal system functionality.

a) Describe how buffering can improve the performance of a computer system running Data Centre Operating Systems. **(4 Marks)**

b) Data Centre Operating Systems performs process scheduling based on priorities using different algorithms. Discuss any four types of these scheduling algorithms. **(8 Marks)**

c) Explain the roles of different scheduling algorithms used by Data Centre Operating Systems. **(8 Marks)**