PAN AFRICA CHRISTIAN UNIVERSITY

Where Leaders are Made

UNIVERSITY EXAMINATIONS: 2025/2026

EXAMINATION FOR DIPLOMA IN INFORMATION AND COMMUNICATION TECHNOLOGY

DICT 0132

PRINCIPLES OF OPERATING SYSTEMS

END TERM EXAMINATION

TIME: 2:00 PM – 4:00 PM

DATE: FRIDAY, JULY, 2026 **TIME: 2 HOURS**

INSTRUCTIONS: Question One is Compulsory, Choose Three Other Questions

SECTION A (COMPULSORY)

QUESTION ONE (15 Marks) Compulsory

a) A university computer lab installs a new OS on all machines. Explain what an operating system is and why it is essential for running applications. **[1 Marks]**

b) During system maintenance, the kernel crashes, a printer driver fails, and the desktop interface becomes unresponsive. Explain the role of each OS element in ensuring smooth operation. **[2 Marks]**

c) A file server sometimes waits for a process to finish before continuing, while other times it allows multiple tasks to proceed. Differentiate between blocking and non-blocking synchronization with one example of each. **[4 Marks]**

d) In a payroll system, multiple users attempt to update employee records simultaneously. Explain three requirements for mutual exclusion that prevent data corruption. **[6 Marks]**

e) A banking application uses the Banker's Algorithm to decide whether granting a resource request keeps the system safe. Define a safe state and explain why it matters. **[1 Mark]**

f) A cloud hosting service allocates memory using the Buddy System. Explain how it works and why it is efficient. **[1 Marks]**

SECTION B

(ANSWER ANY THREE (3) QUESTIONS IN THIS SECTION)

QUESTION TWO (15 marks)

a) An office worker types a report, streams music, and downloads files simultaneously on a desktop computer. Discuss three OS functions that make this multitasking possible. **[5 Marks]**

b) A server allocates memory using best-fit, first-fit, and next-fit strategies. Compare them and state which is fastest, explaining why. **[3 Marks]**

c) A systems developer must choose between user-level threads and kernel-level threads for a scheduling module. Compare them in terms of management, performance, advantages, and limitations. **[6 Marks]**

QUESTION THREE (15 marks)

a) A desktop computer is set up for new employees. Explain the role of hardware, operating system, application programs, and users in making the system functional.

[4 marks]

b) In the context of desktop operating systems used in workplaces and universities, explain five services provided by operating systems that enhance user convenience, giving a practical example of each. **[5 marks]**

c) A distributed database system uses semaphores, monitors, and message passing to coordinate transactions. Explain how each achieves synchronization. **[6 marks]**

QUESTION FOUR (15 marks)

a) A university server schedules exam submissions. Discuss TWO goals of process scheduling and how they improve performance. **[3 Marks]**

b) Explain the roles of short-term, medium-term, and long-term scheduling in managing processes, highlighting one key difference. **[6 Marks]**

c) A system administrator tests scheduling algorithms. Explain SJF, FCFS, and SRT with practical examples from OS process management. **[6 Marks]**

QUESTION FIVE (15 marks)

a) Explain the 5-State Process Model in operating systems, describing the role of each state in managing a program's execution. **[4 Marks]**

b) A computer slows down due to thrashing. Define thrashing, its causes, and how to minimize it in virtual memory management. **[5 marks]**

c) Compare **FIFO**, **LRU**, and **Clock** page replacement policies in virtual memory management with examples from OS usage. **[6 marks]**

QUESTION SIX (15 marks)

a) In a shared computing lab, multiple processes compete for limited printers. Explain the Dining Philosophers Problem and how it illustrates deadlock and starvation. **[5 Marks]**

b) A university has set up a shared computer lab where multiple students log in simultaneously to work on assignments, run simulations, and access online resources. Explain how the operating system ensures efficient operation of the lab by providing the following services: Resource allocation, Accounting, and Protection. **[5 Marks]**

c) Briefly explain the four necessary conditions for deadlock using a scenario of multiple processes competing for CPU and I/O devices. **[5 Marks]**

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