PAN AFRICA CHRISTIAN UNIVERSITY

Where Leaders are Made

UNIVERSITY EXAMINATIONS: 2025/2026

EXAMINATION FOR DIPLOMA IN INFORMATION AND COMMUNICATION TECHNOLOGY

DICT0132

PRINCIPLES OF OPERATING SYSTEMS

END TERM EXAMINATION

TIME: 3:00PM – 6:00 PM

DATE: FRIDAY 31ST JULY, 2026 **TIME: 2 HOURS**

INSTRUCTIONS: Question One is Compulsory, Choose Three Other Questions

SECTION A (COMPULSORY)

QUESTION ONE (15 Marks) Compulsory

a) Discuss what you understand by the term operating system **[2Marks]**
b) Explain the roles of the following basic elements of an operating system: **[3 marks]**

   i. kernel,
   ii. device drivers
   iii. user interface.

c) Differentiate between blocking and non-blocking synchronization, giving one example of each. **[4 marks]**
d) Explain three requirements for mutual exclusion in operating systems, giving examples. **[3 marks]**
e) Describe the banker's algorithm with its functions. **[1 mark]**
f) Explain how the buddy system allocates memory blocks. Why is it considered efficient? **[2 marks]**

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

QUESTION TWO (15 marks)

a) An employee in an organization is working on a computer that is running multiple applications at the same time, typing a report, listening to music, and downloading files. Discuss three functions of the operating system that make this possible." **[6 marks]**
b) In operating systems, compare the best-fit, first-fit, and next-fit memory placement algorithms. State which one is the fastest and explain why. **[5 marks]**

c) Compare user-level threads and kernel-level threads in operating systems in terms of management, performance, advantages, and limitations. **[4 marks]**

QUESTION THREE (15 marks)

a) Explain the role of each of the following components in a computer system: **[4 marks]**
   i. Hardware
   ii. Operating system
   iii. Application programs
   iv. Users

b) Draw a neat diagram showing the relationship between hardware, operating system, application programs, and users. **[5 marks]**

c) Explain how semaphores, monitors, and message passing are used to achieve synchronization in operating systems. **[6 marks]**

QUESTION FOUR (15 marks)

a) Process scheduling is a critical function of an operating system. Discuss three major goals of process scheduling, explaining how each goal contributes to efficient system performance. **[3 marks]**

b) Operating systems use different levels of scheduling to manage processes. Explain the roles of short-term, medium-term, and long-term scheduling, and highlight one key difference among them. **[6 marks]**

c) Explain the following types of scheduling algorithms: **[6 marks]**
   i. SJF
   ii. FCFS
   iii. SRT

QUESTION FIVE (15 marks)

a) Using a well labelled diagram illustrate the 5 State Process Model **[6 Marks]**

b) Define thrashing in the context of virtual memory management in operating systems. What causes it, and how can it be minimized? **[3 marks]**

c) Explain the differences between the **FIFO**, **LRU**, and **Clock page** replacement policies. **[6 marks]**

QUESTION SIX (15 marks)

a) The Dining Philosophers Problem is a classic synchronization problem in operating systems. Explain the problem and discuss how it illustrates issues of deadlock and resource starvation. **[5 marks]**

b) Explain how semaphores, monitors, and message passing are used to achieve synchronization in operating systems. **[6 marks]**

c) Briefly explain the four necessary conditions for deadlock. **[4 marks]**

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