



INFORMATION AND COMMUNICATIONS UNIVERSITY

SCHOOL OF ENGINEERING

DEPARTMENT OF INFORMATION COMMUNICATION & TECHNOLOGY

ICE0124: OPERATING SYSTEMS

END OF SEMESTER EXAMINATION

DEC 2025

Time allowed: 3 HOURS plus 5minutes reading time:

Instructions to Candidates:

1. Check that you have the correct examination paper in front of you.
 2. Answer ALL questions in SECTION A & ANY OTHER Two questions from SECTION B.
 3. All questions carry a Total of 25 Marks
 4. Write down the number of questions that you have answered on the cover of the examination answer booklet.
 5. Non-Programmable Electronic Calculators are allowed
 6. No books, files or other mechanical / electronic aids are permitted.
 7. There shall be no form of communication between students during the examination. Any students caught doing this will be disqualified.
 8. Write down your PARTICULARS clearly on the examination answer booklet.
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DO NOT TURN THIS PAGE UNTIL YOU ARE TOLD TO DO SO.

SECTION A: Compulsory

QUESTION 1

Consider the following set of processes with their arrival and burst times as shown below:

Process	Arrival Time	Burst
P1	2	3
P2	4	2
P3	0	4
P4	1	2
P5	2	1

Using **SJF Preemptive Scheduling**, calculate the following in a TABLE FORMAT for each process: **Completion Time (CT)**, **Turnaround Time (TAT)**, **Waiting Time (WT)**, and **Response Time (RT)**. Also, find the **Average TAT** and **Average WT**.

Given that: $TAT = CT - AT$, $WT = TAT - BT$. [25 Marks]

QUESTION 2

a) Discuss how **artificial intelligence** and **machine learning** are influencing modern operating system design. Focus on areas such as **resource allocation**, **energy efficiency**, **security**, and **predictive task scheduling**. [12 Marks]

b) Assume a future **AI-driven autonomous operating system (AIDOS)** is being developed. Explain how such a system would differ from current systems in terms of:

- Decision-making capability
- Adaptability to new hardware and environments
- Self-healing and optimization features

What technological or ethical challenges might arise from this evolution? [13 Marks]

SECTION B

Answer any TWO (2) questions

QUESTION 3

In multi-core processors, scheduling policies significantly influence performance and throughput.

a) Explain **four (4) challenges** faced by operating systems when implementing **CPU scheduling** on multi-core architectures. [12 Marks]b)

Consider the following processes to be scheduled using **Round Robin Scheduling** with the following parameters and **Q.T = 2 units**:

Process	Arrival Time	Burst Time
P1	3	4
P2	2	8
P3	0	6
P4	4	5

Using a table format, calculate the **Completion Time, Turnaround Time, Waiting Time, and Response Time** for each process. [13 Marks]

QUESTION 4

b) State the necessary and sufficient circumstances that would promote deadlocks to occur. [10 Marks]

b) With the aid of a **well-labelled diagram**, describe the **Process State Transition Model** and explain the significance of each transition (e.g., running → waiting, waiting → ready). [15 Marks]

QUESTION 5

a) Justify the statement:

"A process is a dynamic entity, whereas a program is a static entity."

Support your answer with examples. [7 Marks]

b) Critically discuss how **process synchronization mechanisms** (like semaphores, monitors, and mutex locks) form the backbone of **process management** in multiprogramming environments. [8 Marks]

c) Discuss the various **process control operations** (such as creation, scheduling, suspension, and termination), clearly stating what system calls or kernel functions are typically involved in each. [10 Marks]