বাংলাদেশ আর্মি ইন্টারন্যাশনাল ইউনিভার্সিটি অব সায়েন্স এন্ড টেকনোলজি, কুমিল্লা
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Mid Term Examination, Spring-2025
Department of Computer Science and Engineering
Level- 3 Term- I
Course Code: CSE 311
Course Title: Operating System
Credit Hour: 3
Exam Duration: 1.5 hour
Full Marks: 90

Notes:

a. Each question carries 30 marks.
b. Figure on the right of each question indicate marks for respective question.

Course Outcomes:

[CO-1]: Illustrate the fundamentals concepts of computer system organization and the structure of operating systems. Concept for virtualization, cloud and multiple processor systems.

[CO-2]: Understand and analyze process, thread, memory and file management system. Demonstrate different CPU and disk scheduling algorithms and their respective importance

1. A software development company is setting up an embedded system for an autonomous delivery robot. The robot will operate independently, interact with sensors and actuators, manage real-time tasks like obstacle detection and route tracking, and also connect occasionally to a remote server to update delivery logs. The onboard computer has limited resources and relies on battery power for all its operations. **[CO1]**

   a. Based on the scenario above, identify and explain three key functions that the operating system must efficiently handle to ensure the delivery robot works as intended. Justify your choices based on operating system principles. 18

   b. What type of operating system would be most suitable for this robot? Compare it briefly with at least one other type of OS and explain why your choice is appropriate 12

2. A software company is designing a **multitasking operating system** for a smart surveillance drone that performs the following tasks concurrently:

   - Streaming live video to a control centre
   - Monitoring battery status and triggering return-to-base when low
   - Navigating using GPS data
   - Detecting obstacles using sensors
   - Updating system logs and configuration via wireless communication

   Each of these tasks is implemented as a **separate process**, and the OS must decide how to manage them effectively using **process scheduling**. **[CO2]**

   a. Identify and explain at least **four key components** stored in the **Process Control Block (PCB)** that are essential for managing these drone processes. 15

   b. Explain how the operating system uses **process states** and **context switching** to manage these concurrent processes. 15

3. a. Calculate the average waiting time & average turnaround time of the processes using SJF & SRTF algorithm. **[CO2]** [12+18]

Process	Arrival Time	Burst Time
P1	0	7
P2	1	4
P3	2	1
P4	3	4
P5	4	2

OR

a. Consider the following table of six processes with their respective **arrival times**, **burst times**, and **priorities** (lower number indicates higher priority), Calculate average turnaround time and average waiting time consider its **preemptive** scheduling. **[CO2]** 30

Process	Arrival Time (AT)	Burst Time (BT)	Priority
P1	0	6	3
P2	1	8	1
P3	2	7	4
P4	3	3	2
P5	4	4	5
P6	5	2	1