INSTRUCTIONS

• This exam script has TWO (2) sections.
• Read all questions carefully before attempting.
• Answer All questions in Section A and any other Four questions in Section B.
• Write only your student number on the answer booklet provided.
• None programmable calculator permitted
• Calculators on phones, tablets and computers are NOT permitted in Theory Papers
SECTION A
(Answer ALL questions in this section)

Question 1:
I. Define the following terms (10 Marks)
   a. Operating System
   b. Multi-programming
   c. Time-sharing
   d. Single Processor and
   e. Multi-processor system
II. Elaborate on the role of the following in operating systems (5 Marks)
III. Discuss the term Micro-kernel in modern operating systems (3 Marks)
IV. Identify any four operating systems on each of the following platforms (2 Marks)
   a. Mobile Computing
   b. Traditional/Desktop Computing

SECTION B
(Answer any FOUR (4) questions in this section)

Question 2:
I. Define the purpose of modern Operating Systems (4 Marks)
II. The following Operating system services are Helpful from a Users’ perspective. Expound this on any four (4) (8 Marks)
Question 3:
I. Differentiate between System Programs and Application Programs (4 Marks)

II. Discuss any 5 of the following terms with respect to operating systems (10 Marks)
   a. Distributed Systems
   b. Client-Server Computing
   c. Peer-to-Peer Computing
   d. Virtualization
   e. Cloud Computing
   f. Real-Time Embedded Systems

III. Discuss the purpose of
   a. System calls. (2 Marks)
   b. Application Programming Interface (API) (2 Marks)

IV. Identify & justify two (2) Operating System functions where System Calls are required (2 Marks)

Question 4:
I. Explain the difference between a process and a thread (6 Marks)

II. Study the figure and explain the following states of a process (8 Marks)

III. Discuss the function of a Process Control Block (6 Marks)
Question 5:
I. Explain the term Context Switch (3 marks)
II. Differentiate between an Independent process and a Cooperating process (4 Marks)
III. IPC is the term used to refer to Interprocess Communication. Discuss the two fundamental models of IPC (4 Marks)
IV. Discuss any two benefits of Multithread programming (4 Marks)
V. Explain the any two (2) differences between user-level threads and kernel-level threads? Identify circumstances in which one type preferred over the other? (5 Marks)

Question 6:
I. In process synchronisation we define a Critical Section as a segment of code whose processes may change Common Variables, Update Tables, Write a file, etc for Cooperating processes. Discuss these terms as used in satisfying the requirements of the Critical-Section Problem. (6 Marks)
   a. Mutual exclusion
   b. Progress
   c. Bounded waiting
II. Study the following code segment and answer the questions that follow:
   The definition of wait() is as follows:
   ```
   wait(S) {
   while (S <= 0)
   // busy wait
   S--;
   }
   ```
   The definition of signal() is as follows:
   ```
   signal(S) {
   S++;
   }
   ```
   a. Clarify the application of this code in solving the critical section problem (2 Marks)
III. Deadlocks may arise in Process Scheduling and Synchronisation. Explain and expound on the following terms: (6 Marks)
   a. Difference between Deadlock and Starvation
   b. Deadlock avoidance
   c. Deadlock Detection
IV. Discuss the purpose of CPU Scheduling based on CPU utilisation (4 Marks)

Question 7:
I. Differentiate between Pre-emptive and Non-pre-emptive in CPU Scheduling (4 Marks)

II. Explain the following scheduling Algorithms (6 Marks)
   a. First-come, first-served (FCFS) scheduling
   b. Round-robin (RR) scheduling
   c. Shortest job-first (SJF) scheduling

III. Define the acronym RAID and explain its purpose (4 Marks)

IV. Identify and discuss at least three (4) levels of RAID (6 Marks)

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