



University of Kelaniya – Sri Lanka
Centre for Distance & Continuing Education
Bachelor of Science (General) External
Second year second semester examination - 2019 (2024 February)
(New Syllabus)
Faculty of Science

Computer Science
COSC 27573 - Computer Architecture and Operating Systems

No. of Questions:05

No. of Pages: 03

Time: Two & half (2 1/2) Hours.

Answer **All** questions.

1.
 - a. Define the term “Computer Architecture”.
 - b. List and briefly explain **four (04)** classic components of a computer system.
 - c. Explain the main stages in the Instruction Execution Cycle.
 - i. List the steps needed to execute the machine instruction “Add A, B”.
 - ii. List the steps needed to execute the machine instruction “Add A, B, C”.
 - d. Explain the differences between multiprocessor and multicomputer in terms of their architecture and communication mechanisms.
 - e. State the basic performance equation in computer architecture.
 - i. Explain each term of the basic performance equation.
 - ii. Describe the concept of pipelining in computer architecture and how does it improves CPU performance?
2.
 - a. Define the term Instruction Set Architecture (ISA) and explain its significance in computer architecture.

- b. Provide a detailed comparison of Complex Instruction Set Computing (CISC) and Reduced Instruction Set Computing (RISC) architectures in terms of their design principles and characteristics.
- c. Describe the concept of Addressing Modes in ISA.
 - i. State the main types of addressing modes.
 - ii. Briefly explain the three (03) common addressing modes with suitable examples.
- d. Explain the classification of instructions based on the number of addresses used in computer architecture.
- e. Discuss the concept of stack-based Instruction Set Architecture (ISA) and explain its advantages and disadvantages.

3.

- a. Discuss the role of the below terms in the computer memory hierarchy.
 - i. Cache memory
 - ii. Virtual memory
- b. Briefly explain the four (04) main aims of processor design.
- c. Describe the stages involved in a typical pipelined processor.
- d. Briefly explain the two main components of a processor.
- e. Define a combinational circuit.
 - i. Provide examples of combinational circuits.
 - ii. Explain the operation of a half-adder circuit and provide its truth table.

4.

- a. Describe an Operating System (OS) with its primary functions.
- b. State and briefly explain the main components of OS architecture.
- c. Define a process in the operating systems and explain its different states using a suitable diagram.
- d. What is the role of Process Control Block (PCB) in an operating system?

- e. Briefly explain the inter-process communication and discuss the two main inter-process communication models.
- f. Define the below terms:
 - i. Context Switch
 - ii. System Call

5.

- a. Explain the difference between a process and a thread in the context of operating systems.
- b. State and briefly describe two multithreading models.
- c. Consider a set of three processes P1, P2, and P3 arriving in the order P1, P2, and P3 at time instant 0 and having CPU burst times as shown below:

Process	Burst time (msecs)
P1	24
P2	3
P3	3

- i. Draw the Gantt Chart and calculate the average waiting time, average turnaround time, and average response time using the First Come-First Served (FCFS) scheduling algorithm.
 - ii. Find the results for the above data if the processes arrive in the order P3, P2, and P1.
 - iii. Draw the Gantt Chart and find the average waiting time for the above data using the Round Robin scheduling algorithm with time quantum = 4 ms.
- d. Use suitable examples and explain two dynamic storage allocation techniques.
- e. What is the memory fragmentation? Explain a solution to that problem.

