CLUSTER UNIVERSITY SRINAGAR

Examination: - B.Tech. 4th Sem | Session: 2024-25 | Branch: CSE
Paper Title: Computer Organization and Architecture | | Batch: 2022
Max. Marks: - 100 | Min. Marks: - 40 | Time: - 03 Hours

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Section – A [Long Answer Type Questions] 04 x 12 = 48 Marks

Q1. Describe Amdahl's Law and its significance. A computer system consists of several components, and it takes a total execution time of 100 seconds to complete a task. 60% of the execution time is spent on a particular part of the system. If the performance of this part is improved by 20%, calculate the overall speedup of the system. Using Amdahl's Law, show how the improvement in the specific part affects the overall system performance.

OR

Explain the representation of Real numbers in computers, focusing on both fixed-point and floating-point representation. Also discuss IEEE 754 standard for floating-point arithmetic, highlighting the format for single and double precision.

Q2. Discuss the design of a Micro-programmed Control Unit. How are micro-instructions stored and executed, and what are the advantages of using a micro-programmed approach for control unit design?

OR

Describe the architecture and functioning of a Single Bus organization in a computer system. Discuss its advantages and limitations in comparison to Multiple Bus organization.

Q3. Discuss the importance of Page replacement algorithms in managing the limited physical memory and how do they impact system performance. What is a Page Fault?
Consider a system with a cache that can hold 3 pages. The following page reference string is given:

7, 0, 1, 2, 0, 3, 0, 4, 1, 2, 3.

Using the Least Recently Used (LRU) page replacement algorithm, Find the state of the cache after each page reference. How many page faults occur during this sequence of page references?

OR

Explain Virtual Memory and how it provides an illusion of a large memory space to programs. Discuss the structure of virtual memory and how paging and segmentation play crucial roles in its implementation.

Q4. Explain the concept of Pipeline processing in computer architecture. Discuss the types of pipeline hazards (structural, data, and control hazards) that can occur during pipeline processing. For each type, explain how it affects the performance and what techniques can be used to resolve these hazards.

OR

Explain Flynn's classification of computer architectures. Discuss the characteristics of each category: SISD, SIMD, MISD, and MIMD. Provide examples of each type of architecture and their typical applications.

Section – B [Problem Solving / Medium Answer Type Questions] 04 x 08 = 32 Marks

Q5. Define the terms "computer architecture" and "computer organization". How do they differ from each other? What are the key components of the basic structure of a computer system? Briefly describe the function of each.

OR

Explain the Basic Performance Equation of a computer system. Define Clock rate and explain its significance in determining the performance of a computer. Given two systems with the following characteristics:
System 1: Clock rate = 2 GHz, Execution time = 4 seconds
System 2: Clock rate = 3 GHz, Execution time = 5 seconds
Calculate the performance of each system in terms of millions of instructions per second (MIPS) and compare their efficiency.

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Q6. What is an Instruction set and what is an Instruction Format? Discuss different types of instruction formats (e.g., one-address, two-address, three-address formats) and provide examples of each.

OR

Explain the concept of Addressing modes in computer architecture. Discuss at least four different types of addressing modes with suitable example.

Q7. Explain the concept of Memory Hierarchy. Discuss the different levels of memory in a typical computer system, such as registers, cache, main memory, and secondary storage.

OR

Compare and contrast the following I/O techniques: Interrupts, Polling, Direct Memory Access (DMA). Discuss the advantages and disadvantages of each technique.

Q8. What is Parallel processing and explain the key concepts involved in parallel computing. Discuss the differences between data-level parallelism and task-level parallelism.

OR

Define RISC (Reduced Instruction Set Computing) and CISC (Complex Instruction Set Computing) architecture. Compare both on the basis of instruction set design, hardware complexity, and performance characteristics.

Section – C [Very Short Answer Type Questions Attempt All] 05 x 04 = 20 Marks

Q9. What is MIPS (Million Instructions Per Second) and how is it used to measure performance?

Q10. What is a Hardwired control unit? Discuss the advantages and limitations of hardwired control units in terms of speed, complexity, and flexibility.

Q11. Explain the role and types of registers in a CPU. How do general-purpose registers and special-purpose registers differ in their functions?

Q12. What is Cache memory and what is its role? How does it differ from main memory?

Q13. What are the main design issues of Pipeline architecture? How can pipeline stalls or delays be minimized in a pipelined processor?

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Examination: Minor – II **Time Duration: 1 Hour**

Semester: 4th **Branch: CSE** **Min. Marks: 12**

Subject: Computer Organization & Architecture (PCC CS-401) **Max. Marks: 30**

Note: Attempt any two questions from each section.

Section A (2x10 Marks)

4. What is Instruction Cycle? What are the main phases of the instruction cycle? Explain each phase involved in the Instruction cycle with the help of flow diagram.
5. What is Flynn's Classification? What are the four categories in Flynn's Classification, and how do they differ from one another?
6. What is an Addressing Mode? How do Addressing Modes affect the execution of machine instruction in a CPU? What are the most commonly used types of addressing modes?

Section B (2x5 Marks)

4. Differentiate between Hardwired Control Unit and Microprogrammed Control Unit.
5. What is a Single Bus Organization? What are the components connected to a single bus in a Single Bus Organization?
6. What is Instruction Set? What are the different types of Instructions?

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...mination: Minor – I
Semester: 4th
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Note: Attempt any two questions from each section.

Section A (2x10 Marks)

7. Explain the concept of Stack Organization and its implementation with the help of block diagram.
8. Explain and prove Amdahl's Law?
9. What is Instruction Set? Explain Instruction format and its types.

Section B (2x5 Marks)

10. Define the term Computer Architecture and Computer Organization.
11. Give the Hardware implementation for Addition and Subtraction.
12. Explain the following:

    iii Basic performance Equation

    iv Clock Rate