SABARAGAMUWA UNIVERSITY OF SRI LANKA FACULTY OF
COMPUTING
DEPARTMENT OF SOFTWARE ENGINEERING
BScHons DEGREE PROGRAMMEING SOFTWARE
ENGINNERING
SEMESTER I- END SEMESTER EXAMINATION
JANUARY/ FEBRUARY 2024
TAKE HOME EXAMINATIONS
2021/ 2022 Batch
SE1101 -Computer Organization

Start Date and Time: 9.00 AM

End Date and Time: 3.00PM

Instructions to Candidates

1. Please refer to the Guidelines for Students - Online Examinations, Faculty of
    Computing for advice on how to set out your Assignment.

2. You MUST complete the "Declaration by Student for Online Examination" sheet.

3. All Assignments should comprise the standard Online Exam Cover Sheet given. No
    other front page will be accepted. The cover sheet must be attached to the front of the
    Assignment before submission.

4. Report Writing Guidelines:

    a. Every Assignment should have an Introduction and Conclusion.
    b. The Standard Table of Contents should be generated.
    c. All the Figures, Table Diagrams, etc. should be numbered.
    d. Main Heading Font: Times New Roman – size 16
    e. Sub Heading Font: Times New Roman – size 14
    f. Body text Font : Times New Roman - size 12
    g. Paragraph: Single line
    h. Margins: Top – 1" Bottom – 1". Left – 1". Right – 1"
    i. Header – include the Course Code and Student Index Number on the Right hand side
    j. Footer – include the Page number on the Right-hand side
    k. All sections should have continuity and pages should be clearly labeled.
    l. References – Clear references for all the materials, books, articles, website,
        etc. should be using APA format.

5. File should be saved as mentioned in the Guidelines for Students - Online
    Examinations, Faculty of Computing

Learning outcomes	
ILO1	Outline the concepts of the construction of computer systems
ILO2	Outline working knowledge of a low level & high-level programming of hardware devices.
ILO3	Evaluate the performance of a computer system
ILO4	Present an overview of the main characteristics of computer memory systems and the use of a memory hierarchy
IL05	Identify, understand and apply different number systems and codes

Task 1- Basic Concept and Computer evolution ILO1

1 **a** Discuss the major features of Von Neumann's architecture. How does it differ from Harvard's architecture? **[20 marks]**

b Explore the concept of the von Neumann bottleneck and assess its relevance in contemporary System-on-Chip (SoC) architectures. **[20 marks]**

c Describe Instruction Set Architecture (ISA) and analyze its significance in computer system design. **[20 marks]**

d Describe the fetch-execute cycle in terms of the hardware-software interface between machine instructions and processor components. **[40 marks]**

Task 2-Organization and Architecture, The evolution of theIntelx86 Architecture, Embedded Systems, ARMarchitecture ILO1,ILO2

2 **a** **[100 marks]**

Write one paragraph about the combination of papers 1, 2, and 3. You should briefly summarize the arguments, then describe your opinions on and reactions to the issues introduced in the papers.

1. The Case for the Reduced Instruction Set Computer, David Patterson and David Ditzel. *ACM SIGARCH Computer Architecture News* (15 Oct 1980)

2. Comments on 'The Case for the Reduced instruction Set Computer' by Patterson and Ditzel, Douglas Clark and William Strecker. *ACM SIGARCH Computer Architcture News* (15 Oct 1980)

3. Retrospective on High-Level Computer Architecture, David Ditzel and David Patterson. Proceedings of the International Symposium on Computer Architecture (ISCA) 1981. See ISCA Retrospective

		Task 3- Computer Arithmetic: Addition and subtraction, multiplication Algorithms, Division Algorithms, Floating – point Arithmetic operations. Decimal Arithmetic unit, Decimal Arithmetic operations	**ILO5**
3	**a**	Negative binary numbers can be represented using the sign and magnitude method or the two's complement. Outline the underlying ideas of these two methods and explain their advantages and disadvantages.	**[50 marks]**
	b	Gates are the fundamental building blocks from which a computer is built. Explain what a gate is and in what way it is fundamental to the functioning of a computer.	**[50 marks]**

		Task 4-Computer Performance Issues: Multicore,MICand GPGPUs, Basic Measures of ComputerPerformance,benchmark and SPEC	**ILO3**
4	**a**	You are analyzing the instruction mix of a program, which comprises 40% integer operations, 40% loads and stores, and 20% floating point operations. The associated cycle times for these instructions are 1 cycle for integers, 2 cycles for loads and stores, and 3 cycles for floating point operations. A compiler writer proposes a transformation in which each floating point operation is substituted with 4 integer operations. Additionally, a hardware designer suggests that by eliminating floating point arithmetic entirely, the clock cycle time can be reduced by 15%. Will the combination of these two changes improve or degrade performance, and by how much?	**[100 marks]**

		Task 5- Computer Memory System: CacheMemoryPrinciples, Semiconductor main memory, Externalmemory	**ILO4**
5			
	a	Explore Scott Meyers' 2014 video "Cpu Caches and Why You Care," which delves into the organization of CPU caches, their crucial role in system performance, and recommended software patterns for optimal utilization.	
	b	What key insights does Scott Meyers offer regarding the organization of CPU caches in his article "Cpu Caches and Why You Care," and how do these insights contribute to our understanding of system performance?	**[50 marks]**
	c	How does the knowledge shared by Scott Meyers in this article impact the design and implementation of software, particularly in terms of performance considerations tied to CPU cache utilization?	**[50 marks]**