AHSANULLAH UNIVERSITY OF SCIENCE AND TECHNOLOGY
Department: Computer Science and Engineering
Program: B.Sc. in Computer Science and Engineering
Semester Final Examination: Spring 2020
Year: 2ⁿᵈ   Semester: 2ⁿᵈ
Course Number: CSE 2213
Course Name: Computer Architecture

Time: 3 (Three) Hours   **Full Marks: 60**

Use single answer script

Instructions:	i)	Answer script should be hand written and should be written in A4 white paper. You must submit the hard copy of this answer script to the Department when the university reopens.
	ii)	You must write the following information at the top page of each answer script: **Department:** **Program:** **Course no:** **Course Title:** **Examination:** **Semester (Session):** **Student ID:** **Signature and Date:**
	iii)	Write down Student ID, Course number and put your signature on top of every single page of the answer script.
	iv)	Write down page number at the bottom of every page of the answer script.
	v)	Upload the scan copy of your answer script in PDF format through provided **google form** at the respective course site (i.e., **google classroom**) using institutional email within the allocated time. Uploading clear and readable scan copy (uncorrupted) is your responsibility and you must cover all the pages of your answer script. However, for clear and readable scan copy of the answer script student should use only one side of a page for answering the questions.
	vi)	You must avoid **plagiarism,** maintain **academic integrity, and ethics**. You are not allowed to take any help from another individual and if taken so can result in stern disciplinary actions from the university authority.
	vii)	Marks allotted are indicated in the **right margin.**
	viii)	Necessary **charts/tables** are attached at the end of the question paper. You may use graph papers where necessary.
	ix)	Assume any reasonable data if needed.
	x)	Symbols and characters have their usual meaning.
	xi)	Before uploading, rename the PDF file as **CourseNo_StudentID.pdf** e.g., CSE2213_180204001.pdf

The answer script **(one single PDF file)** must be uploaded at designated location in the provided **Google Form link** available in the Google classroom.

There are 7 (Seven) Questions. Answer any 5(Five).

	Question 1. [Marks: 12]	
a)	What is SPEC rating? What is its purpose? How the SPEC rating is calculated?	**[3]**
b)	Write necessary machine instructions to evaluate the following statement: A= (A+2) *B – C*(D+200) using one address instruction format.	**[4]**
c)	Describe the basic functional units of a computer.	**[5]**

	Question 2. [Marks: 12]	
a)	Briefly explain the three factors that affect the performance of a computer.	**[3]**
b)	What is condition code register or status register? How Condition Codes or Status Flags Set/Reset? Explain with an example.	**[4]**
c)	Write a machine language program to find the multiplication of 10 integer numbers of an array using indirect addressing mode. Assume that the word length is 32 bits and the memory is byte addressable. The addresses of the memory locations containing the 10 numbers are symbolically given as NUM1, NUM2,……….NUM10 and after the multiplication, the result is placed in memory location RESULT.	**[5]**

	Question 3. [Marks: 12]	
a)	Draw the flowchart of Sequential division Algorithm for unsigned numbers.	**[3]**
b)	Design a sequential multiplier circuit for unsigned numbers. Explain its various components and operations.	**[4]**
c)	Multiply $(0101)_2$ by $(0011)_2$ using the Sequential Multiplication Algorithm.	**[5]**

	Question 4. [Marks: 12]	
a)	Define: Strobe, Bit rate, bridge circuit.	**[3]**
b)	What is Synchronous and Asynchronous Bus? What are their relative advantages and disadvantages?	**[3]**
c)	Show the micro routine corresponding to the following instruction: ADD – (R3), R4 for "Single Bus CPU Datapath Architecture". Assume that word length=4 bytes.	**[6]**

Question 5. [Marks: 12]

a)	What is the role of Interrupt Enable and Interrupt Disable instructions? How they are used by ISR? What is the role of the IE bit inside the I/O device interface and inside the CPU?	**[3]**
b)	Identify the differences between single-bus and three-bus architecture.	**[3]**
c)	Describe the two different design paradigms for the CPU control unit.	**[6]**

Question 6. [Marks: 12]

a)	Draw the schematic diagrams of the memory hierarchy and briefly explain the different levels of the memory hierarchy.	**[3]**
b)	"Pipeline increases the throughput of the system, but the latency of each instruction is still remained unchanged" – Do you agree? Explain with an example.	**[3]**
c)	Explain the Direct mapped, Set Associative and Fully Associative Cache Architecture using examples. What are the advantages and disadvantages of direct mapping, associative mapping and set associative mapping?	**[6]**

Question 7. [Marks: 12]

a)	What do you understand by locality of reference? State the two principles of locality of reference.	**[3]**
b)	Describe Superscalar operation.	**[4]**
c)	Explain the Operand forwarding technique with an example.	**[5]**