	Coursework Brief Proofing & Printing Confirmation Sheet
Informatics and Computer Science	
Module Title **Computer Architecture**	Module Code **19CSCI10I**
Module Leader **Prof. Samir Abou ElSeoud**	Semester **Resit**
Proofed by **Dr. Walid Hussein**	

I hereby confirm that:

- This coursework brief has been proof-read (spelling and grammar) | ∗ |

- This coursework brief assesses the ILOs for the module | ∗ |

- This coursework brief follows the approved template | ∗ |

- All questions (and sub questions) have their marks specified | ∗ |

Signed (Proof Reader): _____

Signed (Module Leader) _____

BUE The British University In Egypt الجامعة البريطانية في مصر Informatics and Computer Science	**19CSCI10I** **Resit Assessment One** **2019-2020**	
Module Title **Computer Architecture**		
Module Leader **Professor Samir Abou El-Seoud**	Semester **Resit**	
Assessment Weight **20% of the total course mark**	Time: **60 minutes**	

Instructions to students:

1. The assignment is 4 pages including the cover page.
2. All questions are Mandatory.
3. Feedback: Assessment Model answers will be posted on the e-learning

Marking Schema:

Question	Q1	Q2	Q3	Q4	Q5	Total
Marks	10	10	10	10	10	50

Problem 1

a) A digital computer has a common bus system for 64 registers of 16 bits each. If the bus is constructed with multiplexers.

    i. How many multiplexers are there in the bus?

    ii. What size of multiplexers is needed?

    iii. How many selection lines needed for any multiplexer?

[3 marks, 1 each]

b) A digital computer has a common bus system for 16 registers of 8 bits each. If the bus is constructed with multiplexers. Design the common bus for this system showing only the first two multiplexers and focusing on the first four inputs for each of these multiplexers.

[7 marks]

[Q1 Total: 10 marks]

Problem 2

a) Consider a machine with three instruction classes and Clock cycle as follows:

Instruction class	Clock cycle of the instruction class
A	2
B	5
C	4

Suppose that we measured the code for a given program in two different compilers and obtained the following data:

Code sequence	Instruction Counts in Millions		
	A	B	C
Compiler 1	3	2	5
Compiler 2	5	3	4

    i. What are that system's cycle per instruction CPI and instruction per cycle IPC values for each code sequence?   **[4 marks]**

ii. Which code sequence will execute faster according to CPI?   **[1 mark]**

b) Two enhancements with the following speedups are proposed for a new machine: Speedup (a) = 30, Speedup (b) = 20. Assume that for some set of programs, the fraction of use is 15% for enhancement (a), 25% for enhancement (b). If only one enhancement can be implemented, which should be chosen to maximize the speedup? Show your work out.

[5 marks]

[Q2 Total: 10 marks]

Problem 3

Design an arithmetic and logic circuit for two n-bit data inputs A and B. the circuit generates the following arithmetic operations based on the selection specified, **assuming that the C_{in} of the full adder for the least significant bit is in all cases zero:**

S_1S_0	Operation
0 0	Output = A+B
0 1	Output = A+(A∧B)
1 0	Output = A+B'
1 1	Output = A-1

Draw the logic diagram for the first two stages.

[Q3 Total: 10 marks]

Problem 4:

Write an ARM Assembly program equivalent to the below Java program.

```
int sum =0;
for (int i=0; i<32 ; i++)
{
      sum+= i*2;
      i++;
}
avg = sum/32;
```

[Q4 Total: 10 marks]

Problem 5

a) The following memory units for memory are specified by the number of memory words X the number of bits per word. How many address lines and data lines are needed in each case, given that each cell could store one word of data?

    i. 128Kw×32
    ii. 64Kw×16

[4 marks]

b) Starting from an initial value of R = 10011101, determine the sequence of binary values in R after a circular shift-right, followed by a logical shift left, followed by an arithmetic shift right.

[3 marks]

c) Starting from an initial value of R = 10011101, determine how could we change its value to R = 11100101 using the applications of logical micro-operations, state the operand, operator and the name of the application used.

[3 marks]

[Q5 Total: 10 marks]