UNIVERSITY OF ESWATINI

Faculty of Science and Engineering

Department of Computer Science

SUPPLEMENTARY EXAMINATION

FEBRUARY 2020

Title of Paper: COMPUTER ORGANIZATION AND ARCHITECTURE II

Course Code: CSC 321

Time Allowed: 3 Hours

Total Marks: 100

Instructions to Candidates:

*This Question Paper Consists of **FIVE (5)** Questions. Section A is compulsory.*

*Answer **ALL Questions** in **SECTION A** and **ONE Question** from **SECTION B**.*

Marks are indicated in Square Brackets.

NB: You Are Not Allowed To Open This Examination Paper Until Permission Has Been Granted By The Invigilator

SECTION A

Question One [30]

1. Define the following terms:
   a. Assembly language [1]
   b. Computer organization [1]
   c. Computer architecture [1]
2. List the six (6) levels of a computer system. [3]
3. Explain in detail the process of converting a high-level language to machine code. [4]
4. State any four disadvantages of compilers. [2]
5. List the four (4) categories of instruction types. [4]
6. Describe any two (2) factors that makes a good ISA. [2]
7. List any three (3) factors that a designer should consider when designing the ISA. [3]
8. Is it possible to have zero-address instruction? Explain your answer. [3]
9. List any four (4) addressing modes. [2]
10. State any four (4) factors that determines the use of addressing bits. [4]

Question Two [30]

1. Write the assembly language equivalent of the following instructions:
   a. 0010000000000111 [2]
   b. 1001000000001011 [2]
   c. 0011000000001001 [2]
2. Write a MARIE assembly program that compares two integers stored in location 200 and 220 and stores the larger number in memory location 210. If the two numbers are equal, the program should store 0 in memory location 210. [5]
3. What is required in order to specify the functions of a processor. [4]
4. List and describe the registers that are involved in the fetch and execute cycle. [4]
5. Draw the instruction state diagram. [4]
6. State and describe the two (2) basic tasks that can be performed by a control unit. [4]
7. List three (3) functional requirements that are used to characterise the control unit. [3]

Question Three [15]

1. Define the following terms:
   a. Multicore [1]
   b. Simultaneous multithreading [1]
2. List and describe any two (2) threading granularity options. [4]
3. List the main variables in a multicore organization. [5]
4. Describe the MOESI coherence approach. [4]

SECTION B

Question Four [25]

1. List the two (2) main objectives of the operating. [2]
2. Briefly explain any three (3) services provided by the operating system. [3]
3. Briefly describe how the operating system manages the resources of a computer. [3]
4. List four (4) hardware features that are desirable in simple batch system. [4]
5. Through the use of an example, explain what is meant by:
   a. Uniprogramming [2]
   b. Multiprogramming [2]
6. Briefly describe four (4) sections of a process. [4]
7. What is the difference between a program and a process? [2]
8. In segmentation memory management is it necessary for all of the pages of a process to be in main memory while the process is executing? Explain your answer. [3]

Question Five [25]

1. State any two (2) advantages of a multiprocessor system. [2]
2. List the four (4) categories of the Flynn's taxonomy. [4]
3. Briefly describe three (3) characteristics of Symmetric Multiprocessor (SMP). [3]
4. List and describe the four (4) states of the MESI protocol. [4]

5. Describe any four (4) alternatives to multithreading. [4]

6. List and briefly explain the essential characteristics of cloud computing. [5]

7. List and describe three (3) areas of support offered by a cloud broker. [3]

MARIE INSTRUCTION SET

Mnemonic	Binary	Hex	Explanation
JnS	0000	0	Store the PC at address X and jump to X+1
Load X	0001	1	Load the contents of address X into A
Store X	0010	2	Store the contents of AC at address X
Add X		3	Add the contents of X to AC and store the result in AC
Subt X	0100	4	Subtract the contents of address X from AC and store the result in AC.
Input	0101	5	Input a value from the keyboard into AC
Output	0110	6	Output the value in AC to the display.
Halt	0111	7	Terminate the program.
Skipcond	1000	8	Skip the next instruction on condition
Jump X	1001	9	Load the value of X into PC.
Clear	1010	A	Put all zeros in AC
AddI X	1011	B	Add indirect: Use the value at X as the actual address of the data operand to add to AC
JumpI X	1100	C	Use the value at X as the address to jump to
LoadI X	1101	D	Load indirect: Use the value at X as the address of the value to load.
StoreI X	1110	E	Store indirect: Use X the value at X as the address of where to store the value