



## **UNIVERSITY EXAMINATIONS**

### **SECOND YEAR EXAMINATION FOR THE AWARD OF THE DEGREE OF BACHELOR OF SCIENCE IN COMPUTER SCIENCE**

**FIRST SEMESTER 2022/2023**  
**[SEPTEMBER-DECEMBER, 2022]**

#### **COMP 201: ASSEMBLY LANGUAGE PROGRAMMING**

**STREAM: Y2S1**

**TIME: 2 HOURS**

**DAY: TUESDAY, 3:00 – 5:00 PM**

**DATE: 06/12/2022**

#### **INSTRUCTIONS**

- 1. Do not write anything on this question paper.***
- 2. Answer question ONE and any other TWO questions.***

#### **QUESTION ONE (30 MARKS)**

- a) Explain the meaning of the following terms
- Mnemonics (2 marks)
  - Assembler (2 marks)
  - Flag (2 marks)
  - Directives (2 marks)
  - Segment (2 marks)
- b) By use of a diagram Explain the process involved in Instruction Execution Cycle (4 marks)
- c) Discuss situations that may require programming in assembly language (4 marks)
- d) By use of code illustrations explain the rules that must be followed when using the MOV instruction. (6 marks)
- e) Discuss the various Access Levels of Input-Output Operations. (6 marks)

#### **QUESTION TWO (20 MARKS)**

- a) Using MASM assembler write a program to display "Hello world". (4 marks)
- b) Explain any four general registers (4 marks)
- c) There are 6 16-bit segment registers which define segments in memory. Name and explain the function of each (6 marks)
- d) Give a description of the following instruction sets
- MUL reg/memory (1 mark)
  - DIV reg/memory (1 mark)

- iii. INC reg/memory (1 mark)
- iv. DEC reg/memory (1 mark)
- v. POP reg/memory (1 mark)
- vi. CMP\* reg/memory (1 mark)

**QUESTION THREE (20 MARKS)**

- a) With help of a diagram illustration describe the virtual machine concept. (4 marks)
- b) Using a code illustration explain the advantage of a 3-operand ISA over a 2-operand ISA (4 marks)
- c) By use of MASM code illustrations Explain the meaning of the following terminologies
  - i. Directives (4 marks)
  - ii. Segments (4 marks)
  - iii. Instructions (4 marks)

**QUESTION FOUR (20 MARKS)**

- a) Write MASM assembly code equivalent for the following C function. (6 marks)

```
int sumArray(int * ptr, int count)
{
    int total = 0;
    while (count > 0)
    {
        total += *ptr;
        ptr ++;
        count--;
    }
    return count;
}
```

- b) Perform the following hexadecimal additions:

i) 
$$\begin{array}{r} \text{FFAA} \\ + \text{A100} \\ \hline \end{array}$$
 (1 mark)

ii) 
$$\begin{array}{r} \text{0123} \\ + \text{A5EE} \\ \hline \end{array}$$
 (1 mark)

- c) Perform the following hexadecimal subtractions:

i) 
$$\begin{array}{r} \text{FFFF} \\ - \text{AAAA} \\ \hline \end{array}$$
 (1 mark)

ii) 
$$\begin{array}{r} \text{12AA} \\ - \text{02AB} \\ \hline \end{array}$$
 (1 mark)

- d) With the help of a diagram describe the microcomputer design. (6 marks)
- e) Troubleshoot errors in the program below and state how the error can be rectified (4 marks)

```
.model small
.data
Var1 dw 1
.code
Main proc
Mov eax, var1
Endp
End main
```

### QUESTION FIVE (20 MARKS)

- a) By use of a diagram Discuss four steps taken by the CPU when an INT instruction is invoked by a program (3 marks)
- b) Write an assembly program code that adds numbers(2) and (4) and displays the results on the screen. (6 marks)
- c) Write an assembly program code using the LOOP instruction with indirect addressing that copies a string from source to target, reversing the character order in the process. Use the following variables:  
Source BYTE "This is the source string",0 target BYTE SIZEOF source DUP('#') (3 marks)
- d) Discuss scenarios that we may use the following flags
- I. Carry flag(CF) (2 marks)
  - II. parity flag(PF) (2 marks)
  - III. auxiliary flag(AF) (2 marks)
  - IV. interrupt flag(IF) (2 marks)