KIBABII UNIVERSITY

(KIBU)

UNIVERSITY EXAMINATIONS
2021/2022 ACADEMIC YEAR

SPECIAL/SUPPLEMENTARY EXAMINATIONS
YEAR TWO SEMESTER ONE EXAMINATIONS

FOR THE DEGREE OF
BACHELOR OF SCIENCE
(COMPUTER SCIENCE)

COURSE CODE : CSC 222

COURSE TITLE : ASSEMBLY LANGUAGE PROGRAMMING AND MICROPROCESSOR SYSTEMS

DATE: 27/07/2022 **TIME:** 11.00 A.M – 01.00 P.M

INSTRUCTIONS TO CANDIDATES

ANSWER **QUESTIONS ONE** AND **ANY OTHER TWO.**

QUESTION ONE (COMPULSORY) [30 MARKS]

(a) (i) Define the term **program segment** applicable in assembly language programming? **[2 marks]**

(ii) A typical Assembly language program consist of three segments. List the three segments **[3 marks]**

(b) A computer must be able to take input, process it and produce an output

(i) How is the Information represented in a computer? **[2 marks]**

(ii) Briefly state how the input and output is presented in a form that is understood by users **[2 marks]**

(c) Program segments define the addresses for the 8086 microprocessor when it fetches the instructions (opcodes and operands) from the code segments. For the program segment with the code segment (CS 2500) and an instruction pointer (IP 95F3), compute the following;

(i) Physical address **[2 marks]**

(ii) Logical address **[2 marks]**

(iii) Offset address **[2 marks]**

(d) Assembly language is the most basic low level programming language available for any processor.

(i) State four important features of assembly language programming **[4 marks]**

(ii) List two high level conveniences that lack in assembly language programming **[2 marks]**

(e) Consider an 8086 microprocessor assembly language instruction set below;
MOV dest, source; copy source to destination

i. Briefly state the function of the above assembly language format **[2 marks]**

ii. State the condition that must be met by both source and destination in terms of size and memory location **[2 marks]**

(f) Give three reasons why disassembly is useful in malware analysis **[3 marks]**

(g) State two ways of increasing the speed of processing information in a CPU **[2 marks]**

QUESTION TWO [20 MARKS]

(a) State five advantages of assembly language programming for microprocessor systems **[5 marks]**

(b) List the three types of statements that consist the Assembly Language programs **[3 marks]**

(c) A FLAG register is a 16-bit register with six conditional flags and three control flags

(i) Illustrate using a diagram the structure of a flag register indicating the positions of all flags **[4 marks]**

(ii) Using the same diagram, state the positions that are reserved and undefined **[2 marks]**

(d) The main internal hardware of a PC consists of the **processor, memory** and **the registers**.

(i) Illustrate using a diagram the anatomy of an extended register (32 bit). **[3 marks]**

(ii) State the roles of the following four general registers – EAX, ECX and EDX **[3 marks]**

QUESTION THREE [20 MARKS]

(a) The processor controls the execution of instructions in three continuous steps. State and briefly describe the three steps. **[3 marks]**

(b) State how an overflow occurs in word sized signed numbers and how the register will manage this condition with the programmer **[2 marks]**

(c) Define the following terms applicable in assembly language programming for microprocessors

i. Operation Code **[1 marks]**
ii. Addressing mode **[1 marks]**
iii. Mnemonic **[1 marks]**

(d) Intel implemented the concept of pipelining by splitting the internal structure of the 8086 microprocessor into two sections that works simultaneously. List the two sections and briefly explain the roles for each **[4 marks]**

(e) Assembly language statements are entered one statement per line.

(i) State the format which assembly language statements follow **[2 marks]**

(ii) Write an assembly language code that compiles and displays the string 'Hello World' on the screen **[6 marks]**

QUESTION FOUR [20 MARKS]

(a) An instruction set is usually composed of two parts, the first part is a mnemonic called the OPCODE, while the second part is composed of one or two words. Briefly state the role of the OPCODE and the word(s)

[4 marks]

(b) Define the following terms applicable in microprocessor systems and assembly language programming;

(i) CALL statement

[2 marks]

(ii) Instruction format

[2 marks]

(c) In the 8086 microprocessor systems, the two most ways in which the operand of an instruction are specified are register and immediate addressing modes. Briefly explain in three-point form how each of the two addressing modes operate

[6 marks]

(d) State the role of the following assembler data directives in assembly language programming

(i) ORG (origin)

[1 mark]

(ii) DB (Define byte)

[1 mark]

(iii)DUP (Duplicate)

[1 mark]

(iv) EQU (Equate)

[1 mark]

(e) Briefly state the role of registers in microprocessor systems **[2 marks]**

QUESTION FIVE [20 MARKS]

(a) (i) Define the term stack applicable in program segmentation in assembly language programming

[2 marks]

(ii) Operations of a stack utilizes two main syntax, PUSH and POP. Briefly state the role of each

[4 marks]

(b) State three reasons why assembly language is considered to be more efficient than high level language such as C++?

[6 marks]

(c) Explain the meaning of assembly language programming in microprocessor systems **[2 marks]**

(d) List three types of segment registers and briefly state the role of each in 8086 microprocessor systems

[6 marks]