(Knowledge for development)

KIBABII UNIVERSITY
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UNIVERSITY EXAMINATIONS
2021/2022 ACADEMIC YEAR

END OF SEMESTER EXAMINATIONS
YEAR FOUR SEMESTER ONE EXAMINATIONS

FOR THE DEGREE OF
(COMPUTER SCIENCE)

COURSE CODE : CSC 222

COURSE TITLE : ASSEMBLY LANGUAGE PROGRAMMING AND MICROPROCESSOR SYSTEMS

DATE: 12/5/2022   **TIME:** 9.00 A.M – 11.00 A.M

INSTRUCTIONS TO CANDIDATES

Answer Questions ONE and ANY OTHER TWO.

QUESTION ONE (COMPULSORY) [30 MARKS]

(a) Define the following terms applicable in assembly language programming for microprocessors
- (i)   Mnemonic   **[2 marks]**
- (ii)   Operation code (or opcode)   **[2 marks]**
- (iii)   Addressing modes   **[2 marks]**

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

(c) List the three types of statements that are found in the Assembly Language programs. **[3 marks]**

(d) 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) Logical address **[2 marks]**
- (ii) Offset address **[2 marks]**
- (iii) Physical address **[2 marks]**

(e) The main internal hardware of a PC consists of the **processor, memory** and **the registers**.
- (i) Briefly state the role of registers in microprocessor systems **[1 mark]**

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

- (iii) State the roles of the following four general registers – EAX, EBX, ECX and EDX **[4 marks]**

(f) 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]**

QUESTION TWO [20 MARKS]

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

(b) 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]**

(c) 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]**

(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]**

QUESTION THREE [20 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) Give three reasons why Disassembly Useful in Malware Analysis **[3 marks]**

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

(d) List three types of segment registers and briefly state the role of each in 8086 microprocessor systems **[6 marks]**

(e) State four advantages of assembly language programming for microprocessor systems **[4 marks]**

QUESTION FOUR [20 MARKS]

(a) State two reasons why assembly language is considered to be more efficient than high level language such as C++? **[4 marks]**

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

(d) 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

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

QUESTION FIVE [20 MARKS]

(a)   Define the following terms applicable in microprocessor systems and assembly language programming;
    (i) CALL statement
    (ii) Instruction format

[2 marks]

[2 marks]

(b) 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]

(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 how an overflow occurs in word sized signed numbers and how the register will manage this condition with the programmer

[2 marks]

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

    (i) Origin (ORG)

[1 mark]

    (ii) Data byte (DB)

[1 mark]

    (iii)Duplicate (DUP)

[1 mark]

    (iv)Equate (EQU)

[1 mark]