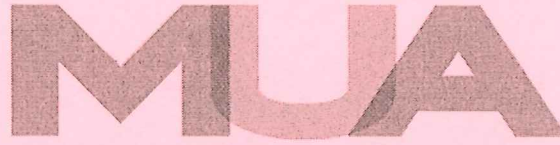


The
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DIPLOMA UNIVERSITY EXAMINATIONS
SCHOOL OF MANAGEMENT AND LEADERSHIP
DIPLOMA IN INFORMATION COMMUNICATION
TECHNOLOGY

DIT 103 : INTRODUCTION TO ASSEMBLY LANGUAGE

DATE: 2ND DECEMBER 2024

DURATION: 2 HOURS

MAXIMUM MARKS: 70

INSTRUCTIONS:

1. Write your registration number on the answer booklet.
2. **DO NOT** write on this question paper.
3. This paper contains **SIX (6)** questions.
4. Question **ONE** is compulsory.
5. Answer any other **FOUR** questions.
6. Question **ONE** carries **30 MARKS** and the rest carry **10 MARKS** each.
7. Write all your answers in the Examination answer booklet provided.

QUESTION ONE

Read the Case Study below carefully and answer the questions that follow:

BASIC FEATURES OF PC HARDWARE

The main internal hardware of a PC consists of the processor, memory and the registers. The registers are processor components that hold data and address. To execute a program the system copies it from the external device into the internal memory. The processor executes the program instructions. The fundamental unit of computer storage is a bit; it could be on (1) or off (0). A group of nine related bits makes a byte. Eight bits are used for data and the last one is used for parity. According to the rule of parity, number of bits that are on (1) in each byte should always be odd. So the parity bit is used to make the number of bits in a byte odd. If the parity is even, the system assumes that there had been a parity error (though rare) which might have caused due to hardware fault or electrical disturbance.

Task:

You are a software engineer tasked with optimizing the performance of a low-level software system. The system uses an x86 microprocessor, and you've noticed inefficiencies in the execution time of a particular function. To improve performance, you decide to rewrite a portion of the software in assembly language, allowing for more control over processor instructions.

Required:

- a) Define assembly language, and how does it differ from machine language?
(4 Marks)
- b) Discuss why assembly language is still relevant for optimizing system performance, especially in relation to high-level languages?
(5 Marks)
- c) Given the assembly language instruction `MOV AX, 0005H`, demonstrate the purpose of this instruction.
(5 Marks)
- d) Analyze how replacing a high-level function with an equivalent assembly language routine could improve the system's performance in terms of execution time.
(5 Marks)

- e) Evaluate the trade-offs of writing code in assembly language versus a high-level language like C. (5 Marks)
- f) Convert this number 1111001 to it's Decimal equivalent and show workings. (6 Marks)

QUESTION TWO

- a) Discuss any four types of assembly language instructions and provide examples [8 Marks]
- b) Define a Programming algorithm [2 Marks]

QUESTION THREE

Look at the code below and answer the Questions that follow:

section .text

```
    global main ;must be declared for linker (ld)
    main: ;tell linker entry point
```

```
    ;writing the name 'Zara Ali'
    mov edx,9 ;message length
    mov ecx,name ;message to write
    mov ebx,1 ;file descriptor (stdout)
    mov eax,4 ;system call number (sys_write)
    int 0x80 ;call kernel
```

```
    mov [name], dword 'Nuha' ; Changed the name to Nuha Ali
    ;writing the name 'Nuha Ali'
    mov edx,8 ;message length
    mov ecx,name ;message to write
    mov ebx,1 ;file descriptor (stdout)
    mov eax,4 ;system call number (sys_write)
    int 0x80 ;call kernel
    mov eax,1 ;system call number (sys_exit)
    int 0x80 ;call kernel
```

section .data

```
    name db 'Zara Ali '
```

- a) When the above Code is compiled and executed, state the result it produces and explain why? (4 Marks)
- b) Discuss the various assembly program segments. (6 Marks)

QUESTION FOUR

- a) Differentiate between a bit and a byte. (2 Marks)
- b) Convert 157 to hexadecimal equivalent and show workings: (2 marks)
- c) State the advantages of using assembly language over high-level languages in robotics programming? (6 Marks)

QUESTION FIVE

- a) State the basic components of an assembly language program? (4 Marks)
- b) Explain the meaning of the following statement "segment. text" (2 Marks)
- c) Discuss the possibility of assembly language programs being portable across different computer architectures? (4 Marks)

QUESTION SIX

- a) Describe the challenges that might arise when writing assembly language code for a robotic arm? (4 Marks)
- b) Highlight any Six Registers that store the arguments for various system calls. (6 Marks)