Fast**National University of Computer & Emerging Sciences, Karachi  
Fall-2024 CS-Department  
Assignment No. 01  
6th September 2024**

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| **Course Code: EE-2003** | **Course Name: Computer Organization & Assembly Language** |
| **Instructor Name / Names:** Shoaib Rauf, Kashan, Aashir Mahboob, Atiya, Muhammad Kariz,Muhammad Usman, Nauraiz Subhan | |

**Instructions:**

* Attempt all the questions.
* Don’t share your work, if your submission is matched to any member of your class, both will be marked 0 straight without asking who shared or who magically copied.
* You have to submit in GCR and also Hard copy in the class on 16th Sept,2024.
* No late submissions will be accepted.

**Max Points**: 50

**Question 1. [6] Points**

1. Compare High level languages with Assembly language, elaborating on there similarities and relationship.
2. Briefly explain the contrast between Assemblers and Compilers.
3. By referring to your explanation in part a and b, explain why High level languages are regarded as more portable as compared to Assembly languages. Justify your answer, with at least two examples.

**Questions 2 [4] Points**

Following is an Arduino compatible C program to blink an LED. Explain, by referring to the levels, the concept of virtual Machines. Also ***identify*** the VM(s) as VM(1) and VM(0), where compilation and translation occur respectively.

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| **Level 3** | **Level 2** |
| #define F\_CPU 16000000  #define BLINK\_DELAY\_MS 1000  #include <avr/io.h>  #include <util/delay.h>  int main (void)  {  // Arduino digital pin 13 (pin 5 of PORTB) for output  DDRB |= 0B100000; // PORTB5    while(1) {  // turn LED on  PORTB |= 0B100000; // PORTB5  \_delay\_ms(BLINK\_DELAY\_MS);    // turn LED off  PORTB &= ~ 0B100000; // PORTB5  \_delay\_ms(BLINK\_DELAY\_MS);  }  } | main:  sbi 0x04, 5 ; PORTB5 output  loop: ; main loop begin  sbi 0x05, 5 ; PORTB5 high  call delay\_1000ms ; delay 1s  cbi 0x05, 5 ; 5 PORTB5 low  call delay\_1000ms ; delay 1s  rjmp loop ; main loop  delay\_1000ms: ; subroutine for 1s delay  ; initialize counters  ldi r18, 0xFF ; 255  ldi r24, 0xD3 ; 211  ldi r25, 0x30 ; 48  inner\_loop:  subi r18, 0x01 ; 1  sbci r24, 0x00 ; 0  sbci r25, 0x00 ; 0  brne inner\_loop  ret |

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| **Level 1** | **Level 0** |
| **AVR enhanced Reduced Instruction Set Computer architecture** | IMG_256 |

**Question 3 [4+2+2+2] Points**

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| **Mnemonic** | **Description** |
| SUB | Subtract one value from another |
| MOV | Move (assign) one value to another |

***MOV EAX, F\_F\_F\_F\_h*** *;Enter the last 4 digits of your roll number in the ;empty spaces e.g roll# = 16K2404 --> F2F4F0F4h*

***ADD EAX, 10000100h*** *;Add 10000100h to the contents of EAX*

1. Fill the table with the updated Flag values after the execution of the aforementioned Assembly language instructions.

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| --- | --- |
| **FLAGS** | **VALUE** |
| Carry Flag (CF) |  |
| Overflow Flag (OF) |  |
| Zero Flag (ZF) |  |
| Sign Flag (SF) |  |
| Parity Flag (PF) |  |
| Auxiliary Carry Flag (AF) |  |

1. Explain why 8086 processors operating in Real Address Modes, can only access  **1MB** of RAM at a time.
2. Using the following Logical Address find the physical address of this memory location.

**12AB:025F**

1. Although 8086 processor has a 20 bit address bus, the segment address and offset are not in 20 bits representation. **Explain why?**

**Question 4 [5] Points**

Write a program that defines symbolic constants for all seven days of the week. Create an array variable that uses the symbols as initializers.

**Question 5 [5] Points**

Using the DUP directive, allocate space for 5 doublewords and 2 bytes in a data segment. Then fill the next 15 spaces with the character &, the 7 spaces that follow with the character % and the space after that with the character capital M.

**Question 6 [5+5] Points**

What are the values of AL register and overflow (OF), Sign Flag (SF)and carry flags (CF) after the execution of code below? Justify your answer. (Show all working of it)

i)

ii)

**Question 7 [5+5] Points**

Let’s suppose ‘dwList LABEL DWORD’ be added in the following code. What are the values of registers in (A-D) in the code below? If there is an error, write ERROR and justify your answer. Please write in hexadecimal form

