



ISLAMIC UNIVERSITY OF TECHNOLOGY (IUT)

ORGANISATION OF ISLAMIC COOPERATION (OIC)

Department of Computer Science and Engineering (CSE)

MID SEMESTER EXAMINATION

SUMMER SEMESTER, 2021-2022

DURATION: 1 HOUR 30 MINUTES

FULL MARKS: 75

CSE 4621: Microprocessor and Interfacing

Programmable calculators are not allowed. Do not write anything on the question paper.

Answer **all 3 (three)** questions. Figures in the right margin indicate full marks of questions whereas corresponding CO and PO are written within parentheses.

1. a) You are given following instructions to run on an 8086 Microprocessor: 11
- Input a value from port 5 (CO2)
 - Add 7 to this value (PO1)
 - Output the result to port 2

Current Memory addresses and memory contents is given in Table 1.

Table 1: Memory addresses and memory contents for Question 1.a)

| Mem. Address | Content (Bin) | Content (Hex) | Operation |
|--------------|---------------|---------------|------------|
| 00100H | 11100100 | E4 | INPUT FROM |
| 00101H | 00000101 | 05 | PORT 05H |
| 00102H | 00000100 | 04 | ADD |
| 00103H | 00000111 | 07 | 07H |
| 00104H | 11100110 | E6 | OUTPUT TO |
| 00105H | 00000010 | 02 | PORT 02 |

Now, construct a diagram that illustrates the information flow while executing the given program and explain that flow of information in a sequential manner.

- b) If the stack segment register contains 56C0H and the stack pointer register contains 1358H, what is the physical address of the top of the stack? Explain using the one Megabyte address space of an 8086 Microprocessor. 7
(CO1)
(PO1)
- c) How would you evaluate the effectiveness of the Instruction Prefetching process in the 8086 microprocessor architecture? Create a flowchart to illustrate the sequence of operations within an 8086 microprocessor during Instruction Prefetching. 7
(CO1)
(PO1)
2. a) Answer the following questions: 5 × 3
(CO1)
(PO1)
- i. Using two's complement arithmetic, subtract the binary number 10101101 from 10110010. Outline each step of the calculation and describe the rationale behind the use of Two's Complement in binary arithmetic.
 - ii. Add the two BCD numbers 0111 1001 and 1001 0101, and explain the process of converting the numbers into decimal form. Determine whether overflow has occurred and if it has, provide a rationale for that occurrence.
 - iii. Differentiate between signed and unsigned overflow in the 8086 microprocessor architecture, providing relevant examples to illustrate each concept. Explain the impact of overflow on program execution and the techniques utilized to prevent it.

- b) Assess the interdependence between CPU clock speed, clock cycle duration, and memory in a computer system. Discuss the impact of each factor on overall system performance, including factors such as throughput and latency. Devise strategies for optimizing these elements to enhance system performance, considering potential trade-offs that may arise. 10
(CO1)
(PO1)
3. a) In order to avoid entering machine code programs into an SDK-86 board manually, a software is being developed to transfer machine code programs from an IBM PC to an SDK-86 board via serial connection. As part of this software, each byte of machine code required to be converted to ASCII codes for the two nibbles (each nibble has 4 bits). For example, a byte of 7AH must be sent as 37H (the ASCII code for 7) and 41H (the ASCII code for A). 13
(CO2)
(PO1)
- Write only the :CODE portion of an assembly language program that performs the required conversion.
- b) Write an assembly language program that calculates the sum of an array of 16-bit integers. The array is stored in consecutive memory locations starting from 231ABH and its size is stored in the DX register. The sum should be stored in the AX register. The data segment starts from the memory address 23100H. 12
(CO2)
(PO1)