**COMSATS University Islamabad, Lahore Campus**

**Department of Electrical and Computer Engineering**

**□Sessional-1 □ Sessional-II ■ Terminal Examination – SPRING 2021**

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| Course Title: | Microprocessor System and Interfacing | | | | Course Code: | CPE/EEE 342 | | Credit Hours: | 4(3,1) |
| Course Instructor: | Dr. Abbas Javed/Dr. Naeem Shehzad | | | | Program Name: | BCE, BEE | | | |
| Semester: | 6th | Batch: | FA18 | Section: | A & B | Date: | | July 13, 2021 | |
| **Time Allowed:** | **180 Minutes** | | | | **Maximum Marks:** | | | **50** | |
| Student’s Name: |  | | | | Reg. No. | | CIIT/ /LHR | | |
| **Important Instructions / Guidelines:**   * This is an open book examination. * The exam is online. The time limit to solve this exam is 3-hour and extra 15 mins are given to upload your exam. * Write your name and registration number in the above-mentioned space using Microsoft Word. * Solve the questions on your notebook and insert the images of your solution at the end of the question paper. * Save your exam file in the following format and submit your exam file on CUonline: * XXE342-S-I-FA1X-00X.PDF | | | | | | | | | |

**Question 1: [CLO1-C4-PLO3] [5]**

Analyze the following assembly language code using the knowledge of 8086 programming model, addressing mode and assembly language programming concepts. You are required to show the value of updated registers after execution of each instruction:

MOV DX, 02000H

MOV SP, DX

MOV DX, 0A000H

MOV SS, DX

MOV AX, 01D00H

MOV BX, 2000H

PUSH AX

PUSH BX

ADD AX, BX

PUSH AX

POP CX

POP DX

**Question 2: [CLO2-C5-PLO3] [4+6]**

Integrate total of 32KB SRAM and total of 16 KB EPROM with 8086 CPU. Available SRAM memory circuits are 4KB chips only and EPROM memory circuits are 2 KB only. Starting address for EPROM is X0000 H and choose suitable starting address for SRAM. Where X is the non-zero least significant digit of your registration number. Draw completely labelled schematic diagram of memory integration with CPU and mention starting and ending address of each chip.

**Question 3: [CLO2-C5-PLO3] [10]**

Integrate 8254 timer with 8086 microprocessor and program counter 1 so that it generates a continuous wave of X00 KHz at OUT1. Program counter 2 so that it generates an interrupt after every X00 micro-seconds where X is non zero least significant digit of your registration number. (For a student with registration number Fa18-BCE-107, X is 7). You are free to choose any suitable address for 8254 timer and suitable input clock frequency.

**Question 4: [CLO2-C5-PLO3] [6+4]**

Integrate 4 coil stepper motor in wave drive mode with 8086 microprocessor using programmable peripheral interface (PPI). Stepper motor should rotate ‘n’ steps in clockwise direction, where n will be entered by the user through 4 slide switches. Integrate 4 slide switches with PPI to input 4-bit data. Write an assembly program to stepper motor and slide switches and draw a schematic diagram. Choose suitable addresses for peripheral interfacing.

**Question 5: [CLO3-C5-PLO3][5+10]**

Design a 8088 microprocessor based temperature controller for maintaining indoor thermal comfort. Temperature controller should control the HVAC to maintain the cooling setpoint entered by the occupant. Temperature controller should turn OFF the HVAC when indoor room temperature is equal to or less than cooling setpoint and turn ON the HVAC when the room temperature is greater than cooling setpoint. As a design engineer, you are required to implement the following tasks:

1. Interface a LM 35 temperature sensor using Analog to Digital Converter (ADC) with 8088 microprocessor. LM35 is a temperature sensor which can measure temperature in the range of -55°C to 150°C. The output voltage of this 3 pin temperature sensor is directly proportional to the ambient temperature and is given by the formula:

Vout =K \* T

Where

K = 10 mv/oC

T = ambient temperature

For a temperature range of 0-100 oC, the output varies from 0-1 V with step of 10 mv. Starting address of the ADC is your registration number. (For a student with registration number Fa18-BCE-**107**, the starting address will be **107**H)

1. Integrate a suitable peripheral for allowing the occupant to enter the required cooling setpoint. Starting address of PPI is 0X000 H where X is least significant digit of your registration number. (For a student with registration number Fa18-BCE-107, the starting address will be 07000H)
2. Integrate a suitable peripheral for displaying the current room temperature.
3. Control the HVAC using digital switch connected to the digital output of the microprocessor.

a) Draw a completely labelled circuit diagram of temperature controller

b) Write an Assembly code for implementing the temperature controller.

***End of Paper***