KATHMANDU UNIVERSITY
End Semester Examination [C]
April/May 2023

Marks Scored:

Level : B.E.
Year : III

Course : EEEG 314
Semester : I

Exam Roll No. :

Time: 30 mins.

F. M. : 10

Registration No. :

Date : 26 APR 2023

SECTION "A"
[20Q × 0.5 = 10 marks]

Encircle the most appropriate alternative from each set of choices.

1. If a microprocessor is capable of addressing 64K bytes of memory, its address-bus width is
   a. 8 bits b. 16 bits c. 20 bits d. 32 bits

2. The timing diagram for CMP M instruction requires … T states.
   a. 4 b. 7 c. 10 d. 13

3. DAD is a/an
   a. data-transfer instruction b. arithmetic instruction
   c. logical instruction d. branch instruction

4. The content of the zero and sign flag … after the execution of the program below will be…

Main Program:	Subroutine:
C000H: MVI A, 05H	2050H: MVI C, FFH
C002H: OUT 30H	2052H: DCR C
C004H: CALL 2050H	2053H: JNZ 2052H
C007H: HLT	2056H: RET

   a. 0, 0 b. 0, 1 c. 1, 0 d. 1, 1

5. The PC contains 8452H and SP contains 88D6H. What will be the content of PC and SP following a CALL to subroutine at location 82AFH?
   a. 82AF, 88D4 b. 82AF, 8450 c. 8450, 88D4 d. 82AF, 8452

6. The total time to execute the following Intel 8085 instruction considering a clock frequency of 2MHz is ….

```
        MVI A, FDH
LOOP:   INR A
        CPI FFH
        JNZ LOOP
```

   a. 67μs b. 33.5μs c. 14μs d. 23μs

7. The HOLD pin is used … Intel 8085.
   a. to acknowledge the interrupt received by b. for DMA operation by
   c. to delay the read or write cycles of d. to latch the address A7-A0 of

8. The A0 pin for Intel 8086 is used to enable … lines during the read or a write operation.
   a. A1-A7 b. A8-A15 c. D0-D7 d. D8-D15

9. The addressing mode for Intel 8086 instruction NOT DI is … addressing mode.
a. register b. immediate c. direct d. base plus index

10. The Intel 8284 generates the … signal during the operation for Intel 8086.
a. DEN b. LOCK c. RDY d. CLK

11. The content of AL register of Intel 8086 after the execution of following instructions are….

```
MOV AL, 4FH
CMP AL, 22H
OUT 30H, AL
```

a. 30H b. 22H c. 4FH d. 2CH

12. The Initialization Command Word 1 (ICW3) for Intel 8259 with a slave at IR0 and IR3 is….
a. 03H b. 11H c. 05H d. 09H

13. The control word of Intel 8255 for the operation of Port A as input, Port B as output in input-output with handshake mode is….
a. B4H b. 94H c. 83H d. A6H

14. The control word for Intel 8253/8254 for software triggered strobe mode with counter 0, 8 bit binary count is….
a. 02H b. 10H c. 12H d. 18H

15. The rate of data transmission in RS 423A is restricted to a maximum of … kbaud for 30ft.
a. 1 b. 20 c. 100 d. 1000

16. The size of scratch pad internal RAM of Intel 8051is ... bytes.
a. 16 b. 40 c. 80 d. 120

17. The content of register A after the execution of the following instructions is….

```
        MOV A, # 00H
        MOV R2, # 05H
REPEAT: ADD A, # 03H
        DJNZ R2, REPEAT
        CPL A
        MOV R5, A
```

a. 00H b. 15H c. 0FH d. F0H

18. The maximum number of I/O devices that can be interfaced with Intel 8086 using I/O mapped I/O concept is….
a. 256 b. 512 c. 65536 d. 131072

19. Intel 8086 is designed to be connected with EPROM capacity of 8kB. The available size of the EPROM chip is 1024 × 4. The number of EPROM chip required for the design will be….
a. 4 b. 8 c. 16 d. 4096

20. The number of flags present in 8051 that respond to math operations are….
a. 2 b. 3 c. 4 d. 5

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SECTION "B"
[5Q. × 8 = 40 marks]

Attempt *ANY FIVE* questions. Assume necessary data if required.

1. a. Describe the function of different bus of a microprocessor. [2]

   b. Draw and explain the timing diagram for the Intel 8086 I/O write machine cycle. [2]

   c. Pedestrian crossing lights are installed at the zebra crossing as shown in the Figure 1 below. The system is controlled by an 8085 microprocessor. Write an assembly language program for 8085 to operate the lights continuously with one light on while the other is off. The green light is turned on for 4 seconds and red light for 10 seconds. Use subroutine for the delay, during each light operation. Assume that the clock frequency of 8085 is 3MHz.

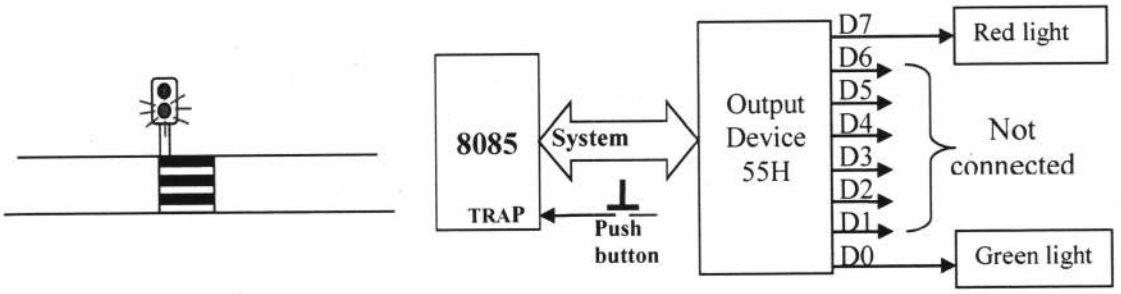


Figure 1

To provide preference to the pedestrians, push button as shown in Figure 1 is also placed at the two sides of the road. If the push button is pressed 50 times the green light for pedestrians is turned on immediately for 4 seconds, and then the operation continues as before. The push button is connected to the TRAP interrupt pin of microprocessor 8085. Write interrupt subroutine for this purpose. [4]

2. a. Explain the operation of Programmable Interval Timer Intel 8253/8254 in mode 2 with timing diagram showing the clock, gate and output signals. [2]

   b. What is Direct Memory Access? Explain with a suitable diagram how a DMA controller performs a direct memory access operation. [2]

   c. Write a program for Intel 8085 to get input from an input device with address 30H and check the type of the number: odd or even, prime or composite and negative or positive. Assume that the output port 40H has 8 pins with 8 LEDs. Pin D0 for prime, pin D1 for composite, D2 for odd, D3 for even, D4 for positive and D5 for negative. Pins D6 and D7 are left unconnected. Turn on/off respective three LEDs depending upon the number. [4]

3. Consider a task of designing an automation system for water supply for a residential colony as shown in Figure 2. There are two tanks, an underground tank and an overhead tank. The water from the Municipal Water Supply Authority of the city comes to the underground tank through gravity and later it is pumped to an overhead tank using a pump-motor set.

Water is supplied to various residential units from the overhead tank based on the level in the tank. There is an escape valve in the underground tank which operates automatically if the underground tank becomes full, a condition which seldom occurs. In the present system, the levels in the underground tank as well as the overhead tank are measured through a float and pulley sensor and the pump motors are operated manually. Similarly, the distribution valves for water distribution to different residential units are also operated manually.

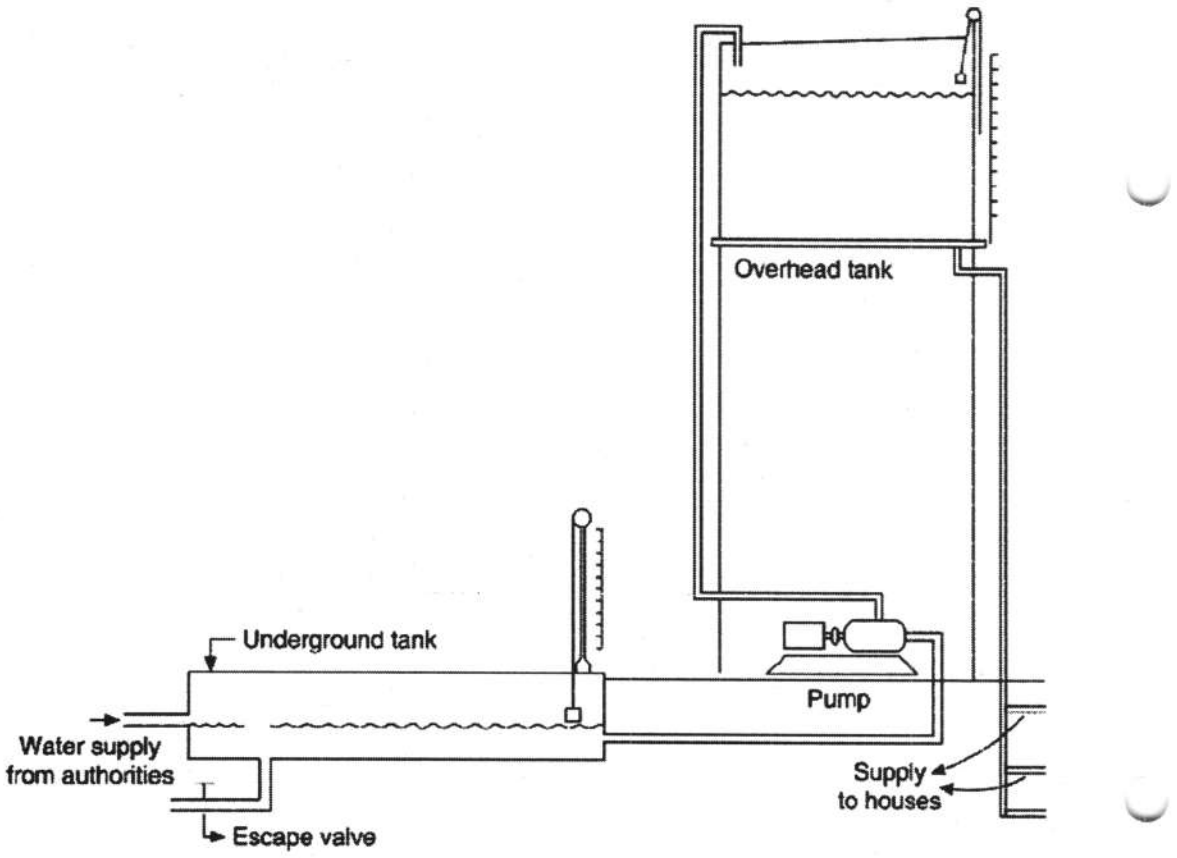


Figure 2

It is an ineffective control prone to human error and leads to wastage of water, shorter life of motors. It is desired to have a system which can operate automatically without manual intervention/supervision. A microprocessor based system is to be designed which should perform the following functions:

- Level sensing and control of water in the overhead tank
- Level sensing of water in the underground tank
- Start and stop of pump motors for pumping water to the overhead tank from the underground tank
- Distribution of water to the residential units as per the given time schedule

Design a circuit using Intel 8086 and Intel 8255 with all the sensors and actuators interface for the system operation. Also write a program for the proper operation of the system. [4+4]

4. a. The Figure 3 below shows a solar collector to track the sun. The solar collector is attached to a DC motor and the sun is tracked by two light sensors at two sides of the solar collector. If both the sensor sends '1' the motor is to be stopped. If only sensor1 sends '1' the motor is to be rotated in one direction and if only sensor2 sends '1' the motor is to be rotated in the other direction. For a DC motor "10" at the supply pins rotates the motor in one direction and "01" rotates the motor in the other direction.

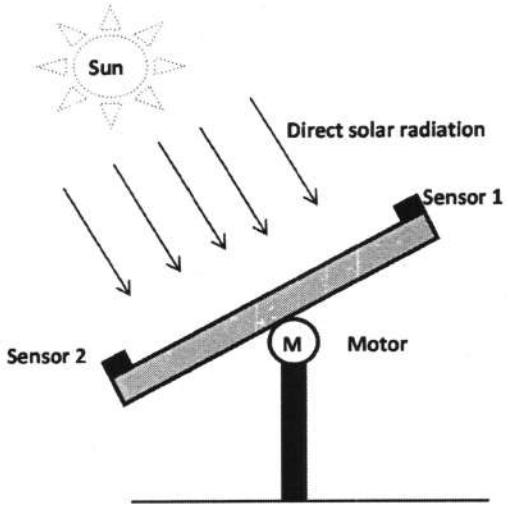
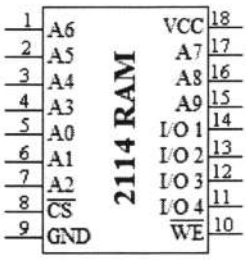


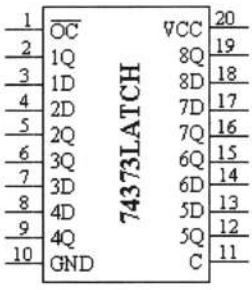
Figure 3

Assume your own interface requirements and write a program for the operation of an Intel 8051 based system. [4]

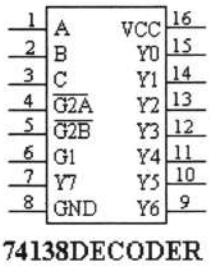
b. Design a circuit to interface microprocessor Intel 8085 with total memory capacity of 2kB. Use the RAM and the supporting chips as shown in Figure 4 for the interconnection. [4]



A0-A9: Adress lines
I/O 1 - I/O 4 : Data lines
$\overline{CS}$: Chip select
$\overline{WE}$: Write Enable



Q = D if $\overline{OC}$ = 0 and C = 1



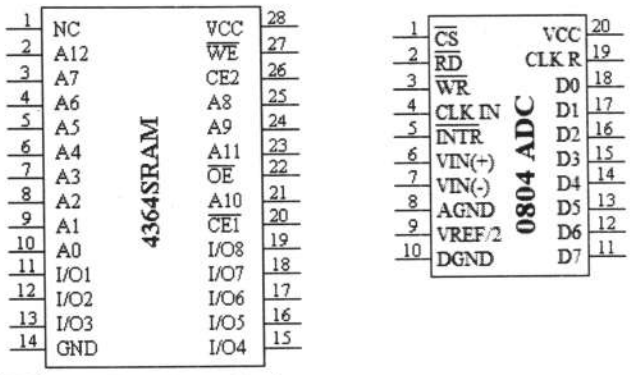
74138DECODER

$\overline{G2A}$, $\overline{G2B}$, G1 are enable pins
A,B,C are inputs
Y0-Y7 are outputs(active low)

Figure 4

5. a. Explain how GPIB can be used for I/O interface with microprocessor. [2]

b. A data logger for voltage measurement using a potential transformer, analog to digital converter, and memory is to be designed for a transformer substation of a village power distribution system Nepal. Design a circuit for the proposed system with Intel 8086. Use the 4364SRAM and 0804 ADC as shown in Figure 5 for the interconnection. [4]



$\overline{CE1}$ and CE2 : chip enable pins
$\overline{OE}$: Outpute enable(Read)
$\overline{WE}$: Write enable
NC: No connection
A0-A12: Address pins
I/O1-I/O8: Input/Output (data) pins

Figure 5

c. Explain difference between maximum and minimum modes of operation of Intel 8086. [2]

6. a. What is Interrupt Vector Table? Explain how that is used for interrupt handling. [2]

b. Design a circuit to interface Intel 8051 with a dc motor. What are the practical consideration to be taken for the interface and how that is incorporated in the circuit? [2]

c. Journal entries are to be prepared for a company. All the debits are assumed positive numbers and credits are assumed negative numbers. Business transactions are entered using input device with address 20H. All the debits are to be stored in effective memory address starting from C000H; and all the credits are to be stored at effective memory address starting from D000H. Write a program for Intel 8086 to get input entries and sort the debits and credits at the memory locations as mentioned above. Completion of all the entries is denoted by 01H input from input device with address 21H. [4]