# MACHAKOS UNIVERSITY

**University Examinations for 2021/2022**

**SCHOOL OF ENGINEERING AND TECHNOLOGY**

**DEPARTMENT OF ELECTRICAL AND ELECTRONIC ENGINEERING**

**THIRD YEAR SECOND SEMESTER EXAMINATION FOR**

**DIPLOMA IN ELECTRICAL ENGINEERING**

**EED 312: MICROPROCESSOR SYSTEMS**

**DATE: 17/12/2021** **TIME: 8.30-10.30 AM**

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**INSTRUCTIONS:**

**ANSWER QUESTION 1 IN SECTION A AND ANY OTHER TWO QUESTIONS FROM SECTION B**

**SECTION A: ANSWER QUESTION 1 IN THIS SECTION**

1. (a) Draw a labeled block diagram of a typical digital microcomputer and explain the function of the main components. (9 marks)

   (b) A certain microcomputer has a RAM semiconductor memory chip with 3072 words. Each word is 16 bits wide. Determine;

   (i) Number of address lines

   (ii) Capacity in kilobytes

   (iii) Number of hexadecimal digits needed to state an address value. (6 marks)

   (c) Explain the need of each of the following Intel 8085 microprocessor pins;

   (i) ALE

   (ii) INTR

   (iii) HOLD (6 marks)

   (d) Explain the meaning of the following assembly instructions and for each case state the addressing modes used;

   (i) MOV B,C

   (ii) STA $6000_H$

   (iii) MVI M,45H (9 marks)

**SECTION B: ANSWER ANY TWO QUESTIONS FROM THIS SECTION**

2. (a) Explain the function of each of the following microprocessor registers.

(i) Instruction Register

(ii) Program counter

(iii) Stack Pointer

(iv) Accumulator (8 marks)

(b) Write an assembly language program for the following algorithm:

- move data 32H to register B

- load register A with immediate value 96H

-move data 1900H to register pair BC

-transfer content of accumulator to memory address 2000h

-move data in memory address 7000h to register C

-move content of H and L to memory starting at address 8000h

-exchange content of register pair DE to that of HL

-transfer content of memory address 2000h and 2001h to register pair HL

-move content of accumulator to register C

-processor halt (12 marks)

3. (a) Table 1 shows Intel 8085 assembly program.

(i) Draw the program trace table

(ii) Write its equivalent machine code program. (10 marks)

Table 1

| Assembly Mnemonic |
|---|
| ORG 2000H |
| MVI B, 18H |
| MVI A, 12H |
| ADD B |
| LXI H, 3000H |
| MOV M, A |
| HLT |

(b) With an aid of a labeled block diagram explain how a prototype microprocessor is tested using In-Circuit Emulator. (10 marks)

4. (a) Describe FIVE software tools in the development of a microcomputer.(10 marks)

(b) Determine the condition of the flags after each of the following CPU operations.

(i) $B7_H+A2_H$

(ii) $45_H-37_H$. (10 marks)

5. (a) (i) Outline the sequence of events when a CPU receives an interrupt signal.

(ii) Describe a non-maskable interrupt citing an example in Intel 8085 CPU. (8 marks)

(b) Draw a labeled block diagram showing the connection of three devices to a microprocessor using the Daisy Chain prioritization method. Explain the working of your diagram. (12 marks)