MACHAKOS UNIVERSITY

University Examinations for 2024/2025 Academic Year

SCHOOL OF ENGINEERING AND TECHNOLOGY
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

FOURTH YEAR FIRST SEMESTER EXAMINATION FOR DEGREE IN BACHELOR OF SCIENCE IN EDUCATION

SPH 441: MICROPROCESSOR APPLICATIONS

DATE: 17TH JANUARY 2025 **TIME: 2.00 PM – 4.00 PM**

INSTRUCTIONS:
*Answer question **ONE (Compulsory)** and **any other TWO** questions*

QUESTION ONE *(COMPULSORY)* (30 MARKS)

a) Giving functional differences, compare and contrast a microprocessor and a microcontroller **(4 marks)**

b) Outline two advantages of build-in peripherals as used in microcontroller design and construction **(2 marks)**

c) Convert the following numbers:

i) 120_{10} into the binary number system **(2 marks)**

ii) 10100111_2 into the decimal number system **(2 marks)**

iii) 560_{10} into the octal number system **(2 marks)**

iv) 111010111_2 to the hexadecimal number system **(2 marks)**

v) $5C_{16}$ to binary number system **(2 marks)**

vi) 276_8 to decimal **(2 marks)**

d) With reference to ASCII chart, represent the word “Machakos” in to its equivalent binary format **(5 marks)**

e) Given binary numbers:

i) 10100100 and 11011111,

ii) 11111 and 11111, perform binary addition **(4 marks)**

f) With the aid of an electronic circuit and a truth table, implement an OR gate logic operation **(3 marks)**

QUESTION TWO (20 MARKS)

a) Explain the basic difference between 8085 and 8086 microprocessors based on bit capacity **(1 mark)**

b) Analyze the following registers as used in microprocessors
   i) Accumulator
   ii) Program counter and
   iii) Memory address register **(6 marks)**

c) With the aid of a diagram, evaluate the organization of registers in 8086 microprocessor **(4 marks)**

d) Analyze classifications of microprocessor based on its architecture **(2 marks)**

e) Describe an assembler as used in low level language programming **(1 mark)**

f) With the aid of a block diagram, analyze the general architecture of a microprocessor **(6 marks)**

QUESTION THREE (20 MARKS)

a) Discuss types of programming languages as used in microprocessors **(9 marks)**

b) Analyze the structure of an instruction set in assembly language **(2 marks)**

c) Design data transfer instruction to transfer data from register source to register destination in 8086 microprocessors **(2 marks)**

d) Design data transfer instruction to transfer the content of the accumulator to output port with address 038H, considering 8086 microprocessor **(2 marks)**

e) With the aid of discrete electronic components and a truth table, design an AND-gate operation **(5 marks)**

QUESTION FOUR (20 MARKS)

a) Outline advantage and disadvantage of cache memory in a microprocessor system **(2 marks)**

b) Evaluate features that have made semiconductor memories more popular **(4 marks)**

c) List the instruction set of 8086 microprocessor **(6 marks)**

d) Using instruction set of 8086 microprocessors, design an arithmetic instruction to put immediate number 038AH to CX **(2 marks)**

e) Using the instruction set of 8086 microprocessor, design an arithmetic instruction to subtract AX from the content of register BX **(2 marks)**

f) Explain two ways in which high level language can be converted to machine language **(4 marks)**

QUESTION FIVE (20 MARKS)

a) With the aid of block diagrams, analyze Harvard and Von Neumann computer architecture outlining features in each. **(8 marks)**

b) Evaluate three addressing modes of 8086 microprocessor **(6 marks)**

c) With the aid of a block diagram, analyze the structure of a microcontroller **(6 marks)**