



MACHAKOS UNIVERSITY

University Examinations for 2023/2024 Academic Year

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF ELECTRICAL AND ELECTRONIC ENGINEERING

FOURTH YEAR FIRST SEMESTER EXAMINATION FOR

BACHELOR OF SCIENCE (TELECOMMUNICATION AND INFORMATION
TECHNOLOGY)

SPH 420: MICROCONTROLLERS AND PLC TECHNOLOGY

DATE:

TIME:

INSTRUCTIONS

Answer Question One and Any Other Two Questions

Question One [30 marks]

- (a) Write a program to add the values of locations 50H and 51H and store the result in location 52H and 53H. . (6 marks)
- (b) i. List the timer instruction of PLC; (3 marks)
- ii. Explain the ON delay timer in details. (3 marks)
- (c) With the aid of a circuit diagram describe the operation of one input terminal of An AC discrete input module. (8 marks)
- (d) Write a program to add two 16 bit numbers stored at locations 51H-52H and 55H-56H and store the result in locations 40H, 41H and 42H. Assume that the least significant byte of the data and the result is stored in low address and the most significant byte of data or the result is stored in high address, (10 marks)

QUESTION TWO (20 MARKS)

- (a) Write a program segment that uses timer 1 in mode 2 to toggle P1.0 once whenever the counter reaches a count of 100. Assume the timer clock is taken from an external source P3.5 (T1)
(6 marks)
- (b) Draw ladder diagram for 2 motor operations for following condition:
(i) Start push button start motor M1 & M2
(ii) Stop push button stop motor M1 first & after 10 seconds motor M2.
(8 marks)
- (c) Write assembly language program to perform AND, OR and XOR operation on two data. Data 1 is at internal RAM location 40 H and Data 2 is at external memory location 2000 H. Store result at three successive locations in internal RAM i.e. 50 H, 51 H and 52H respectively.
(6 marks)

QUESTION THREE (20 MARKS)

- (a) Create a PLC logic diagram that carries out the following sequence of events using timers.
- When switch two (SW2) is closed, the red pilot light (Red_PLT) turns on, motor one (M1) starts running, and the bell sounds.
 - After 10 seconds, M1 stops running and the white pilot light (White_PLT) turns on.
 - Fifteen seconds later, Red_PLT and White_PLT turn off, and the green pilot light (Green_PLT) turns on.
 - Finally, five seconds later, both motors one (M1) and motor two (M2) start running.
 - If switch one SW1) is opened, the process is halted.
- (12 marks)
- (b) Write a program for the 8051 to transfer letter 'A' serially at 4800 – baud rate, 8 bit data, 1 stop bit continuously.
(8 marks)

QUESTION FOUR(20 MARKS)

- (a) Write a program to continuously generate a square wave of 2 kHz frequency on pin P1.5 using timer 1. Assume the crystal oscillator frequency to be 12 MHz

(10 marks)

- (b) With the help of neat diagram explain the concept of sourcing and sinking DC input module of PLC.

(10 marks)

QUESTION FIVE (20 MARKS)

- (a) Write a program for the 8051 to transfer the message 'EARTH' serially at 9600 baud, 8 bit data, 1 stop bit continuously.

(12 marks)

- (b) Draw the ladder diagram for 2 major operations (i-iii and ii-iv).
- i. When start button is pushed motor M1 and M2 start.
 - ii. After 10 sec. motor M1 stops.
 - iii. Motor M2 stops 15 sec. after motor M1 has stopped.
 - iv. Both M1 and M2 will stop when stop push button is pressed.

(8 marks)