TECHNICAL UNVERSITY OF MOMBASA

Faculty of Engineering & Technology in Conjunction with Kenya Institute of Highways and Building Technology (KIHBT)

DEPARTMENT OF ELECTRICAL & ELECTRONIC ENGINEERING

HIGHER DIPLOMA IN ELECTRICAL & ELECTRONIC ENGINEERING

EEA 3107: MICROCONTROLLER SYSTEMS

END OF SEMESTER EXAMINATION
SERIES: AUGUST 2014
TIME: 2 HOURS

<u>**Instructions to Candidates:**</u>
You should have the following for this examination
-   *Answer Booklet*
-   *Electronic Calculator*
-   *Drawing Instruments*
This paper consists of **FOUR** questions. Answer any **THREE** questions
All questions carry equal marks
Maximum marks for each part of a question are as shown

Question One

a) Explain the functions of the following registers: **(8 marks)**
    (i) W
    (ii) PCH
    (iii) TRIS B
    (iv) PCL

b) Draw the block diagram of a microcontroller and explain the functions of each part. **(8 marks)**

c) Distinguish between the following instructions:
    (i) CALL
    (ii) RETURN **(4 marks)**

Question Two

a) Outline FOUR features used to distinguish microcontrollers from microprocessors. **(8 marks)**

b) Draw the pin configuration diagram of a typical microcontroller and explain the functions of each.
(8 marks)

c) (i) Explain why the WDT must be reset when running a program.

    (ii) Explain the function of the OPTION register. **(4 marks)**

Question Three

a) (i) Explain any THREE application areas of microcontrollers.

    (ii) Explain the functions of the following:
    (i) INTCON register
    (ii) STACK **(7 marks)**

b) Explain the following operations:
    (i) BTFSC PORTA, 2
    (ii) ADDLW b'10101001'
    (iii) INCFSZ f, d **(6 marks)**

c) Write instructions for the following operations:

    (i) Configure PORTB of the PICI6F84A microcontroller to be used as follows:
        RBO to RB3 as input and RB4 to RB7 as output
    (ii) Load the w register with 35f.
    (iii) Decrement registers OCH by one and save the results in the same register. **(7 marks)**

Question Four

a) Eight LEDs are connected to PORTB of the PICI6F84A to implement a running light.

(i) Draw the circuit

(ii) Write the program **(14 marks)**

b) Outline the steps to be taken in 'burning' (or programming) the microcontroller. **(6 marks)**

Question Five

a) Explain THREE reasons for interfacing in microcontroller based circuits. **(6 marks)**

b) (i) Distinguish between the operations XORLW and XORWF

(ii) Draw a table showing all possible configurations of the prescalar. **(6 marks)**

c) Explain the following types of microcontrollers:
  (i) CISC
  (ii) RISC
  (iii) External memory
  (iv) Embedded **(8 marks)**