**NNAMDI AZIKIWE UNIVERSITY AWKA**

**FACULTY OF ENGINEERING**

**DEPARTMENT OF ELECTRONICS AND COMPUTER ENGINEERING**

**COURSE CODE: ECE 517**

**COURSE TITLE: REAL TIME COMPUTING AND PROGRAMMING**

**1st SEMESTER 2016/2017 TIME 3HRS Date: 9th March 2017**

**SECTION A (attempt all questions from this section)**

**Question 1**

(a) (i) What is a real-time system and what is it required to do?

 (ii) Give examples of real-time systems, where they are used and what they do in each area of application.

(b) When is a system considered to have failed?

(c) Why must we try to avoid bus contention in a real-time system?

**Question 2**

(a) What is an interrupt and how are they classified?

(b) Explain how a microprocessor services an interrupt request.

(c) State the draw back in the machine language and assembly language programs

**Question 3**

(a) How is a DMA initiated?

(b) Explain the working of a handshake input port

(c) What are the advantages of:

* Subroutine
* Assembler

**SECTION B (answer only one question from this section)**

**Question 4**

 A real-time system is to be installed at the entrance door of a church building such that when somebody enters the church, there will be an LCD display of **THE LORD IS MY HOPE AND COMFORTER.** The system is to be designed using AT89C52 microcontroller and 12MHz crystal oscillator. Draw the block diagram and the circuit diagram for the interface. Develop a sub-program in Assembly Language for this display only.

**Question 5**

Thirty-two LEDs are connected to the four ports (P0,P1,P2 and P3) of an AT89C51 microcontroller. Write an Assembly language program for an ON/OFF operation of the 32 LEDs, such that when Port 0 and Port 2 are ON, Port 1 and Port 3 are OFF; and when Port 0 and Port 2 are OFF, Port 1 and Port 3 are ON. Show the code table and the interfacing diagram. Use 16 MHz crystal oscillator and a delay of one second. Develop the algorithm (program flowchart and the pseudocode) for the operation.

**SECTION C (answer only one question from this section)**

**Question 6**

(a) How do you achieve alternation of poles with the brushless motors?

(b) How many 8-bit port do you need in order to connect an 8x8 matrix keyboard to a microcontroller?

(c) If increase or decrease in voltage drop equals the temperature change and sensitivity is 1volt/oC, calculate the final temperature if a current of 3A is passed through an RTD of 100ohms and causes its resistance to increase by 10ohms. Assume that the RTD’s original temperature was 20oC.

**Question 7**

(a) Given that a microcontroller is a scaled down version of a microprocessor, mention 3 reasons why one would choose a microcontroller over a microprocessor in an application?

(b) What is the first step to take in a program that detects and identifies key activation in a 4x4 matrix keypad arrangement?

(c) In reference to the diagram given (in your note) identify the key pressed given the following conditions:

(i) D3 - D0 = 1111 for the row, D3 - D0 = 1111 for the column

(ii) D3 - D0 = 0000 for the row, D3 - D0 = 1111 for the column

(iii) D0 – D3 = 1001 for the row, D0 – D3 = 0101 for the column

(iv) D0 - D3 = 1101 for the row, D3 - D0 = 0111 for the column