ELIZADE UNIVERSITY, ILARA-MOKIN, ONDO STATE

FACULTY OF ENGINEERING

DEPARTMENT OF ELECTRICAL AND COMPUTER ENGINEERING

FIRST SEMESTER EXAMINATION, 2017/2018 ACADEMIC SESSION

COURSE TITLE: EMBEDDED SYSTEM DESIGN

COURSE CODE: ECE 513

EXAMINATION DATE:

COURSE LECTURER: Dr. Folasade Dahunsi

HOD's SIGNATURE

TIME ALLOWED: 3 HOURS

INSTRUCTIONS:

1. ANSWER ANY FOUR QUESTION IN **SECTION A** AND ONE QUESTION IN **SECTION B**
2. ALL QUESTIONS SHOULD BE ATTEMPTED AND ANWERED IN THE ANSWER BOOKLETS
3. SEVERE PENALTIES APPLY FOR MISCONDUCT, CHEATING, POSSESSION OF UNAUTHORIZED MATERIALS DURING EXAM.
4. YOU ARE **NOT** ALLOWED TO BORROW ANY WRITING MATERIALS DURING THE EXAMINATION.

SECTION A

Question 1

a. What are the Characteristics of an Embedded System (5 marks)
b. With a neat diagram explain the architecture of 8051 (5 marks)
c. A P89C664 microcontroller has an 11.0592MHz crystal-controlled clock oscillator. Write an assembly language program that will generate a 5 kHz square wave signal on pin 7 of port 1 when a switch causes pin 0 on the same port to go to logic 1. (5 marks)

Question 2

a. Describe the basic Structure of an Embedded System (5 marks)
b. Discuss briefly the following types of storage registers: Accumulator, R register, Data Pointer (DPTR), Program Counter (PC), Stack Pointer (SP) (5 marks)
c. A P89C664 microcontroller has a clock frequency of 11.0592 MHz. What is the time for each cycle?

Question 3

a. What ae the most notable differences between a microprocessor and a microcontroller. (5 marks)
b. Discuss three addressing modes in 8051 architecture (4 marks)
c. If Vcc = 5V and for an LED, Vf = 0.7V and the pin P0.0 of the microcontroller port can sink 10mA and source 50 μA.
   i. How you connect the LED to the microcontroller and
   ii. Calculate the value of series resistor R (5 marks).

Question 4

a. Distinguish the Von Neumann Architecture from the Harvard Architecture (4 marks)
b. Succinctly explain RAM Memory Space Allocation in 8051 (5 marks)
c. Describe the difference between these instructions
   i. ACALL and AJMP
   ii. INC A and ADD A,#1
   iii. DEC A and SUBB A,#1 (6 marks)

Question 5

a. Differentiate a CISC from a RISC (5 marks)
b. What are the basic Criteria for Choosing Microcontroller (5 marks)
c. Describe the main assembler directives of 8051 microcontroller (5 marks)

SECTION B

Question 1

Implement a traffic light which takes in two options (decimal numbers: 1 and 2) and displays green and red alternatively with timing based on the option chosen.

a. Option One
   i. Green light for 20 seconds
   ii. Red light for 10 seconds

b. Option Two
   i. Green light for 20 seconds
   ii. Red light for 15 seconds (15 marks)

Question 2

Design a counter which accepts 1 and 2 as decimal numbers and counts down based on the option pressed and also blinks the LED based on the number pressed

a. Pressing 1 makes the counter count down from 5 seconds to 0 second and the LED blinks once
b. Pressing 2 makes the counter count down from 10 seconds to 0 second and the LED blinks twice (15 marks)

Question 3

Design a mini calculator which takes in two decimal numbers as input and it can add, subtract, multiply and divide them giving a result less than 9. An E (Error) is given as output if the result is greater than or less than nine. The output is 7 LEDS arranged in the form of a 7 segment LCD matrix. For example LED b and c comes up for result 1

(15 marks)