



# UNIVERSITY OF MINES AND TECHNOLOGY, TARKWA

FIRST SEMESTER EXAMINATIONS, NOV/DEC 2018

**COURSE NO:** CE 371

**COURSE NAME:** EMBEDDED SYSTEMS DESIGN II

**CLASS:** CE III

**TIME:** 3 HOURS

Name: \_\_\_\_\_ Index Number: \_\_\_\_\_

## SECTION A

*Carefully read each question and then indicate by writing whether the statements provided are TRUE or FALSE*

1. Different PIC Microcontrollers have the same on-board peripherals? \_\_\_\_\_
2. An example of an on-board peripheral on System-On-Chip is I2C? \_\_\_\_\_
3. Sensors can be designed for virtually every physical and chemical quantities? \_\_\_\_\_
4. The I/O pins in PIC 16877A are arranged into 3 main ports? \_\_\_\_\_
5. The PIC 16877A has two pairs of power pins which are +5v and 0v? \_\_\_\_\_
6. All PIC microcontrollers use only flash memory? \_\_\_\_\_
7. A write to PORTx sends data to the port latch register LATx? \_\_\_\_\_
8. The TRISx register configures the port signal direction in a PIC microcontroller?  
\_\_\_\_\_
9. Memory system starts with the register files in an embedded system? \_\_\_\_\_
10. The main memory system of an embedded device may be only contained on-chip?  
\_\_\_\_\_

11. The SDRAM is an off-chip variety of memory technology used in System-On-Chips?  
\_\_\_\_\_
12. Most embedded systems devices use more than one level cache? \_\_\_\_\_
13. The PIC16 series is a high-performance PIC microcontroller which is 16-bits?  
\_\_\_\_\_
14. The synchronous bus is a faster bus compared to a serial bus? \_\_\_\_\_
15. All PIC microcontrollers used the Von Neuman Architecture? \_\_\_\_\_
16. A flash memory can be written to only once? \_\_\_\_\_
17. Timer overflow is a source of interrupt on a microcontroller? \_\_\_\_\_
18. A translator is used to complete code for a target CPU that is different from the developing CPU? \_\_\_\_\_
19. Software embedded in hardware is called firmware? \_\_\_\_\_
20. USB device can be either bus-powered or self-powered? \_\_\_\_\_

**[20 MARKS]**

**SECTION B:**  
*Answer Only 1 question*

**Question One:**

- a. Give five requirements of software for embedded system. **[10 MARKS]**
- b.
- I. What is a Real-Time System? **[3 MARKS]**
  - II. Differentiate between soft real-time and hard real-time systems **[4 MARKS]**
- c.
- I. What is Bus Arbitration? **[3 MARKS]**
  - II. State four (4) characteristics of a bus. **[8 MARKS]**
- d. Give four (4) characteristics of the PIC 16877 microcontroller. **[12 MARKS]**

**Question Two:**

- a.
- I. State three (3) software quality measurements for an embedded systems. **[6 MARKS]**
  - II. Provide the steps for developing software for an embedded system. **[7 MARKS]**
- b.
- I. What defines a bus system? **[5 MARKS]**
  - II. Briefly explain how a bus transaction takes place. **[6 MARKS]**
- c. Give the four (4) main types of buses in terms of how data can be transferred from one point to the other. **[8 MARKS]**
- d. Write down four (4) main architectural features of PIC Microcontroller family. **[8 MARKS]**