RAJARATA UNIVERSITY OF SRI LANKA
FACULTY OF APPLIED SCIENCES

B.Sc. General Degree in Applied Science
Third Year Semester II Examination - April/May 2016

COM 3304 - Embedded Systems

Time allowed: Three Hours

Instructions for candidate

- This is a closed book examination.
- There are **FIVE (5)** pages in the question paper.
- Time allowed will be **THREE(3)** hours.
- Question paper consists of **SIX (6)** questions.
- Answer any **FIVE (5)** questions
- All questions carry equal marks.

Q1.

1. What is an Embedded System? Write down four examples. (4 marks)
2. Take one of the above mentioned examples and justify that the example is an Embedded System by explaining its characteristics. (4 marks)
3. What are the three IC Technologies discussed in Embedded Systems. (3 marks)
4. Compare and contrast the Processor Technologies discussed in ES technologies (6 marks)
5. Write down three advantages of using PLD technology in Embedded Systems. (3 marks)

Total Marks: 20

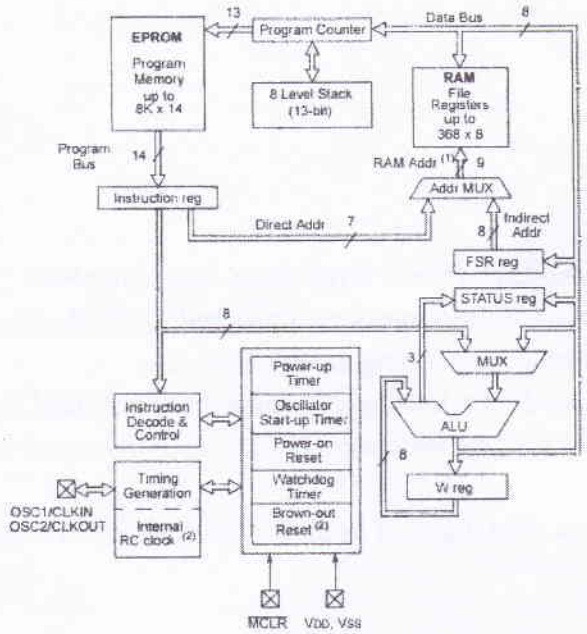
Q2.

1. Define Development Processor and Target Processor. (4 marks)
2. Briefly explain what a Digital Signal Processor is. (4 marks)
3. Compare and contrast the Counter and Watch Dog Timer (WDT). (4 marks)
4. What are the sub operations of an Instruction Cycle? (6 marks)
5. Define Harvard memory architecture. (2 marks)

Total Marks: 20

Q3.

1. Write down five characteristics of RISC architecture. (5 marks)
2. What are the addressing modes available in a Mid Range PIC microcontroller? (3 marks)
3. Briefly explain FLASH memory used in PIC microcontrollers. (3 marks)
4. What is the use of W register in PIC ALU? Explain. (3 marks)
5. Explain each of the addressing modes mentioned in part 2. Using the block diagram given below. (6 marks)



Total Marks: 20

Q4.

1. What is the difference between combinational logic and sequential logic? (2 marks)
2. Compare and contrast Half Adder and Full Adder. (4 marks)
3. Draw the truth table for a 2-bit comparator with three outputs "less than", "equal" and "greater than". (4 marks)
4. Use Karnaugh maps to minimize logic in part 3 and Draw the simplified circuit. (6 marks)
5. Briefly explain the Shift Register using a suitable diagram. (4 marks)

Total Marks: 20

Q5.

1. Compare and contrast the Microcontroller and Microprocessor. (4 marks)
2. Write down four microcontroller manufacturers. (2 marks)
3. Briefly explain cache Hit and Miss. (2 marks)
4. What are the basic components of an Embedded System? (4 marks)
5. Write down four development documents used in ES designing. (4 marks)
6. What does the programmer need to consider when selecting a processor for an ES? (4 marks)

Total Marks: 20

Q6.

1. What are the four sources of interrupts you can handle using PIC processors? (4 marks)
2. Suppose your are writing a program which handles a RB0 interrupt. What are the bits that you need to set in the INTCON Register and why? (4 marks)

INTCON REGISTER (ADDRESS 0Bh, 8Bh)

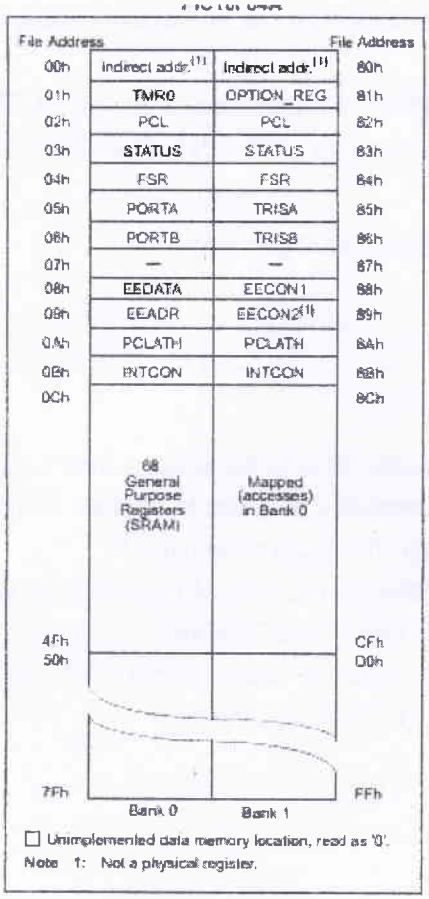
R/W-0	R/W-0	R/W-0	R/W-0	R/W-0	R/W-0	R/W-0	R/W-x
GIE	EEIE	T0IE	INTE	RBIE	T0IF	INTF	RBIF
bit 7							bit 0

3. When an interrupt occurs, what is the address the PC points to? (2 marks)
4. Write an Assembly Language program to create a Knight Rider circuit. Register map of 16F84A microcontroller is given in page 5 (4 marks)
5. State the difference between the following instruction sets
   a. DECF and DECFSZ
   b. ADDLW and ADDWF
   c. BTFSC and BTFSS

(6 marks)

Total Marks: 20

Register Map of PIC16F84A Microcontroller



End of the paper