# UNIVERSITI SAINS MALAYSIA

Semester I Examination
Academic Session 2010/2011

November 2010

# EEE 520 – EMBEDDED MICROPROCESSOR SYSTEMS

Time: 3 Hours

INSTRUCTION TO CANDIDATE:

Please ensure that this examination paper contains **FIVE** printed pages and **SIX** questions before answering.

Answer **FIVE** questions.

Distribution of marks for each question is stated accordingly.

All questions must be answered in English.

1.    (a)    While an ISR is executing, no other maskable interrupts will be acknowledged, unless the ISR itself makes this response possible. However, when the ISR has completed its execution, the microprocessor will again be waiting for the react of maskable interrupt. Explain the mechanism that makes this achievable and how the ISR itself will permit the maskable interrupts to be responded during its execution.

(50 marks)

(b)    In order to compute the system's worst case response time, it is necessary to calculate and examine all the sources of interrupt that causes the longest delay to the servicing of the highest priority interrupt. In order to meet the system with the minimum interrupt response, we can create that particular system with few simple rules. Explain those rules.

(50 marks)

2.    (a)    There are only so many ways to connect a flash memory to a processor, but there are numerous ways to implement almost any software function. However, embedded software usually is built on only a few architectural frameworks. Describe all.

(50 marks)

(b) Describe and explain the following methods for describing software design for microprocessor embedded system:

(i) Data flow diagram

(ii) State diagram

(iii) Flowcharts

(iv) Pseudo code

(50 marks)

3. (a) There are two levels of language that can be used during development of an embedded system. List and describe briefly each of the language level used?

(50 marks)

(b) A design engineer is required to develop an embedded system to control the automatic gate at the school of Electrical and Electronic Engineering building. Compare and determine the suitability of the language level used during the development.

(50 marks)

4. (a) What are the factor should be consider when selecting a communication bus and protocol for a multiprocessor system.

(50 marks)

(b) Ideally, the software will not be tried until the hardware is completely check out. In real system, the hardware cannot be checked without software to exercise it. List the check list for the hardware design and discuss briefly.

(50 marks)

5. (a) Discuss the advantages and limitations of an embedded system? What are the items which should be taken into consideration in the selection of a processor for an embedded system? How can we reduce its cost for large scale production?

(30 marks)

(b) What do you understand by bus loading ? Under overloaded condition, what type of problems may arise? How can you decrease them? Explain with the help of suitable diagrams.

(30 marks)

(c) What do you understand by the software and hardware requirements of an embedded system? What are the factors which will decide the details of the hardware and software? What are the reasons due to which software specifications are not included in the detailed design of the system while hardware specifications are given with complete details?

(40 marks)

6. (a) What are the problems experienced in the design of an embedded system in the industry? How are these solved by taking different platforms for the design purposes? Explain with suitable examples the advantages and limitations of PC-Platform.

(25 marks)

(b) What is the importance of ROM in embedded systems? What are its different versions used in practice. Compare the performances of PROM and EPROM. Explain using suitable diagrams, the working principles of EPROM. What are the steps in the programming of an EPROM? Draw the timing diagram of an EPROM for read and write operations. State the conditions under which it is used in embedded systems.

(30 marks)

(c) What is the basic unit of a SRAM. Explain READ and WRITE operations with circuit diagram as well as timing diagrams. Explain the configuration which can be used to expand the word size of a RAM.

(25 marks)

(d) Describe I2C Bus and its importance in port-to-port communication between peripherals.

(20 marks)

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