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UNIVERSITI SAINS MALAYSIA

First Semester Examination  
Academic Session 2011/2012

January 2012

**EEE 520 – EMBEDDED MICROPROCESSOR SYSTEM**

Time : 3 hours

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**INSTRUCTION TO CANDIDATE:**

Please ensure that this examination paper contains **SIX** printed pages including Appendices (5 pages) and **SIX** questions before answering.

Answer **FIVE** questions.

Answer to any question must start on a new page.

Distribution of marks for each question is given accordingly.

All questions must be answered in English.

1. (a) A design engineer required to develop an embedded system to control temperature in all room at PPKEE building. Compare and determine two types of language level used during development proless.

(50 marks)

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

(50 marks)

2. (a) Multiprocessor system developed for an embedded system may reduce the cost but requires more than a single microprocessor/microcontroller. Determine criteria for choosing the number of processor sub-system and how to distribute the task among them.

(50 marks)

- (b) Top-down design and modular design are program design techniques could be used to ease the task in the design phase during software development process. Explain each of the techniques with the examples.

(50 marks)

3. (a) Most of the embedded system design require Real Time Operating System (RTOS). Multitasking is one of the feature for a RTOS. Explain the multitasking used in the RTOS briefly?

(50 marks)

- (b) What are the factors should be consider when selecting a communication bus and protocol for a multiprocessor system.  
(50 marks)
  
- 4. (a) State the difference between microwire and I<sup>2</sup>C bus protocol.  
(20 marks)
  
- (b) Explain how to start reading and how to end reading of data using I<sup>2</sup>C bus protocol.  
(30 marks)
  
- (c) In Figure 1, the SHT75 sensor can be connected to an I<sup>2</sup>C bus without interference with other devices connected to the bus. By using microcontroller suggest how to read data from the SHT75 sensor.  
(50 marks)

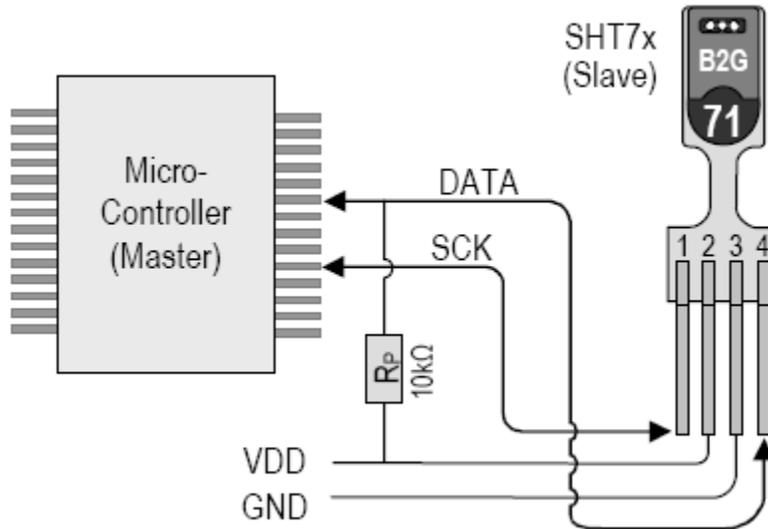


Figure 1: Typical Application Circuit using SHT75 sensor

5. Figure 2 shows pin assignments of DRAM with the serial number of MT4C1004J 883C. A logic HIGH on /WE dictates READ mode while a logic LOW on /WE dictates WRITE mode. Figure 3 shows the functional block diagram of the DRAM.

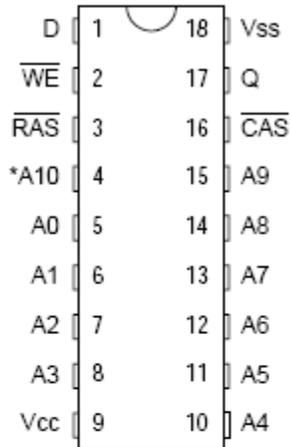
(a) From the Figure 2 what is the capacity of the DRAM (20 marks)

(b) Give one advantage and one disadvantage of DRAM compared to SRAM (20 marks)

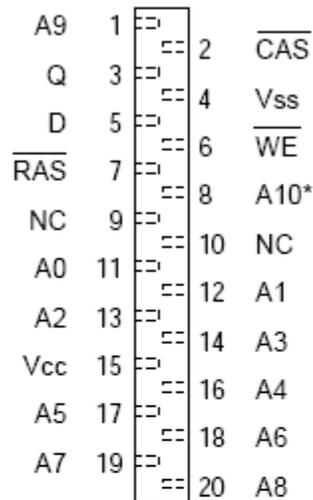
(c) Give a hardware design to read data from the DRAM. Explain your design using timing diagram. (60 marks)

## PIN ASSIGNMENT (Top View)

### 18-Pin DIP



### 20-Pin ZIP



### 20-Pin SOJ 20-Pin LCC 20-Pin Gull Wing

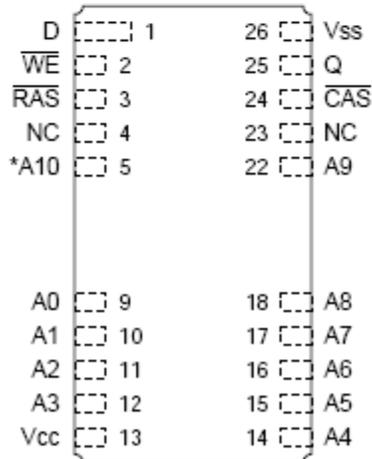
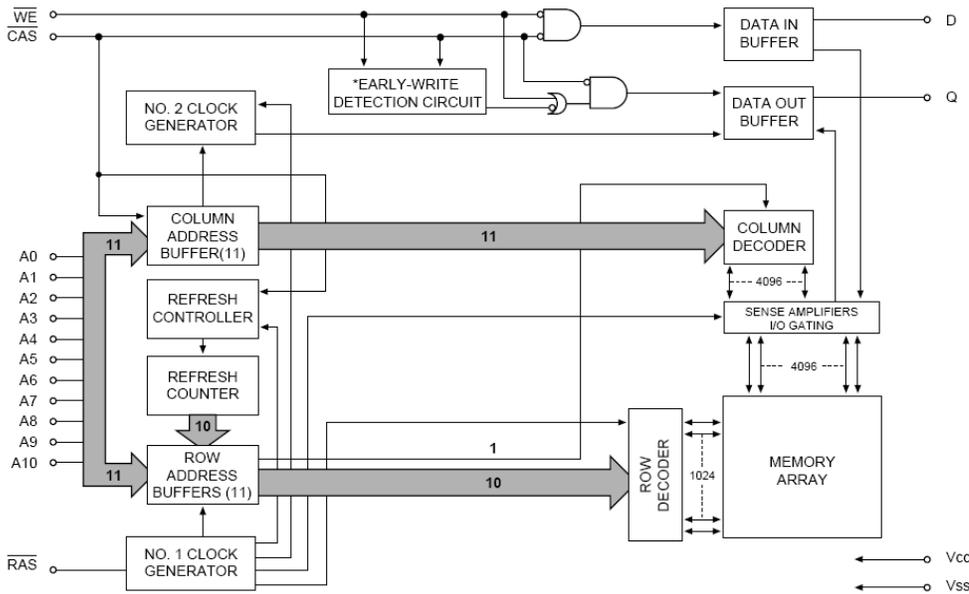


Figure 2 : Pin Assignment of DRAM

### FUNCTIONAL BLOCK DIAGRAM FAST PAGE MODE



\*NOTE:  $\overline{WE}$  LOW prior to  $\overline{CAS}$  LOW, EW detection circuit output is a HIGH (EARLY-WRITE)  
 $\overline{CAS}$  LOW prior to  $\overline{WE}$  LOW, EW detection circuit output is a LOW (LATE-WRITE)

Figure 3: Functional block diagram of the DRAM

6. (a) Discuss about the system definition that is required in embedded system design for an application of swimming pool pump timer. (30 marks)
- (b) Gives one example of when interrupt happen and discuss about the steps in executing the interrupt. (30 marks)
- (c) Design an application involving Interrupt to communicate with other processor. Explain your design using block diagram and flow chart of the operation. (40 marks)