มหาวิทยาลัยสงขลานครินทร์

คณะวิศวกรรมศาสตร์

Midterm Examination Term 1 2554

Date 7 Aug 2011 Time 13.30-16.30

Subject: 241-307, ~~240-208~~ Computer Systems Architecture Room A400, A401

Lecturer: Dr. Watcharin Kaewapichai, Dr.Jerry LeMieux

Exam Duration: 3 hours

This exam has 15 pages.

Authorized Materials:

- Writing instruments (e.g. pens, pencils).
- Books (e.g. dictionaries, textbooks) notes and calculators are **not** permitted.

Instructions to Students:

- *Answer questions in English.* Perfect English is **not** required.
- Attempt all questions.
- Write your answers in the space provided
- Clearly number your answers.
- Any unreadable parts will be considered wrong.
- When writing programs, use good layout, and short comments;
  points will not be deducted for minor syntax errors.
- The points for each question are given in brackets (…).

Name ……………………………….. ID …………………….

1. Please explain the detail/meaning of computer components and their functions   (1 point)

CPU

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Main Memory

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Input/Output System

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Interconnection (BUS)

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Storage

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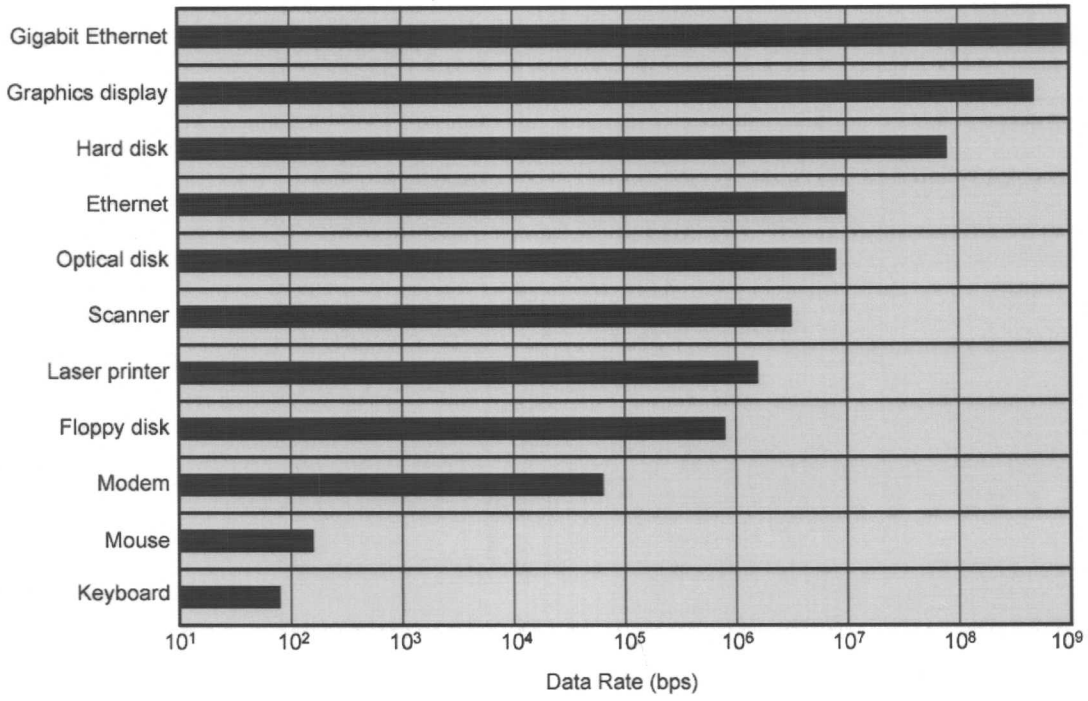2. CPU   (1 point)

    2.1. Inside CPU, How many main structures/components?

    2.2. Please explain the detail/meaning of the CPU structures in 2.1

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3. From these graph, please explain, Why do the devices have a different speed? (1 point)

Data Rate (bps)

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4. Please explain the difference, advantages, and disadvantages of Multiplexed and Dedicated bus.   (2 point)

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5. Assumption: Maximum main memory 4 GBytes   (20 points)

    5.1. Fully Associate mapping: Cache level 1 128 Kb. Please design the number of bits in the offset, index, and tag bits.

    5.2. 2 Ways Associate mapping: Cache level 2 256Kb. Please design the number of bits in the offset, index, and tag bits.

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6. From PCI timing diagram   (5 points)
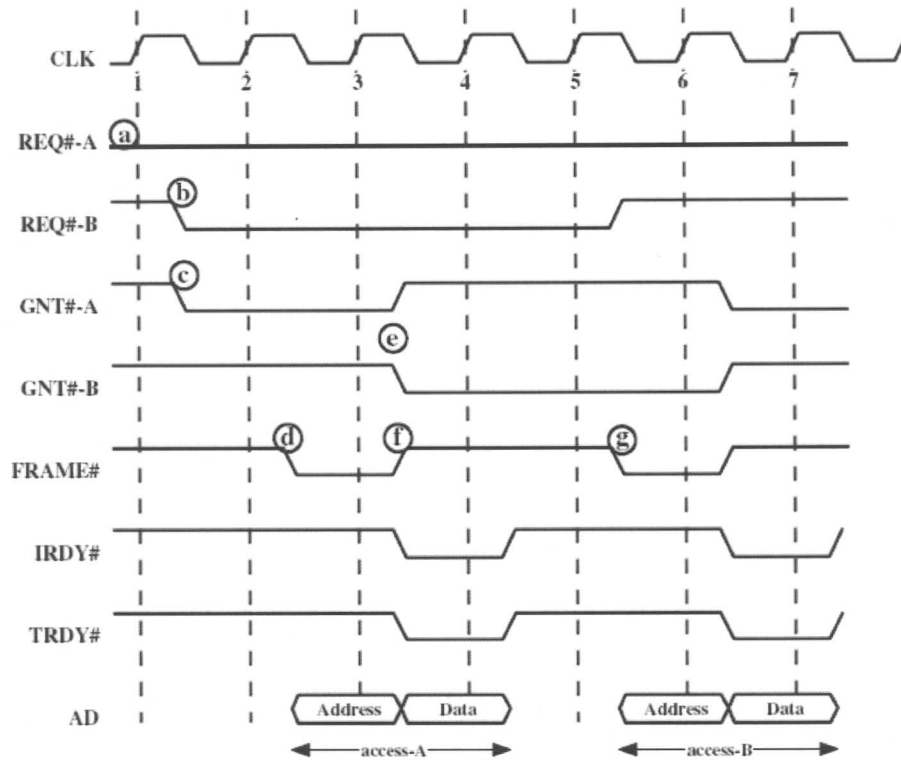
6.1. Please explain these worlds.

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6.2. Please explain the events **a** to **g**

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7. SEC-DED error checking, please design the SEC-DED error checking from the assumptions (1 points)

- CPU read/write data 16 bits

- System must fix the 1 bits error

   Questions: Calculate the number of check bit

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8. Please explain the detail/meaning of these words   (1 point)

    8.1. CPI _____

    _____

    8.2. MIPS_____

    _____

9. From the instruction cycle chart, Please explain the working sequence of Fetch Instruction
    and Execute Instruction   (2 points)

Fetch Cycle   **Execute Cycle**

START → Fetch Next Instruction → Execute Instruction → HALT
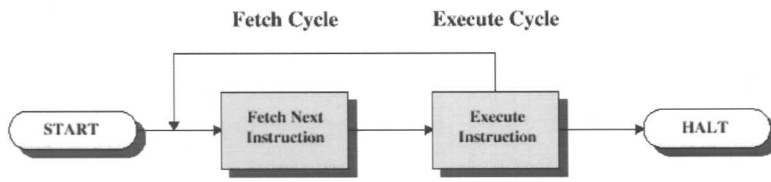
    9.1. Fetch Instruction

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    9.2. Execute Instruction

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Name ……………………………….. ID ……………………

10. Please explain the advantages and disadvantages of Nested and Sequential multiple Interrupt? (2 points)

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11. What is the difference of **Nonvolatile memory** and **volatile memory?** (1 point)

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12. Please explain the difference, advantages, and disadvantages of SRam and Dram (1 point)

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13. Please explain these words: **ROM**, **PROM, EPROM,** and **EEPROM** (1 point)

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14. How many possible maximum memories of this chart? (3 points)


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          ┌──────────┐    W₀ ┌──────────────────────┐
          │          ├──────┤                      │
          │  7-bit   ├──W₁──┤                      │
          │ decoder  │  ⋮   │                      │
          │          ├──W───┤                      │
          └──────────┘      └──────────────────────┘
                                                      Sense/Write
                                                       Circuitry
                              □   □   ...   □
13-bit                      ┌──────────────────────┐
address                     │  output multiplexer  │◄──── R/W
                            │        and           │
                            │  input demultiplexer │◄──── CS
                            └──────────────────────┘
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                                        ▼
                                 Data input/Output
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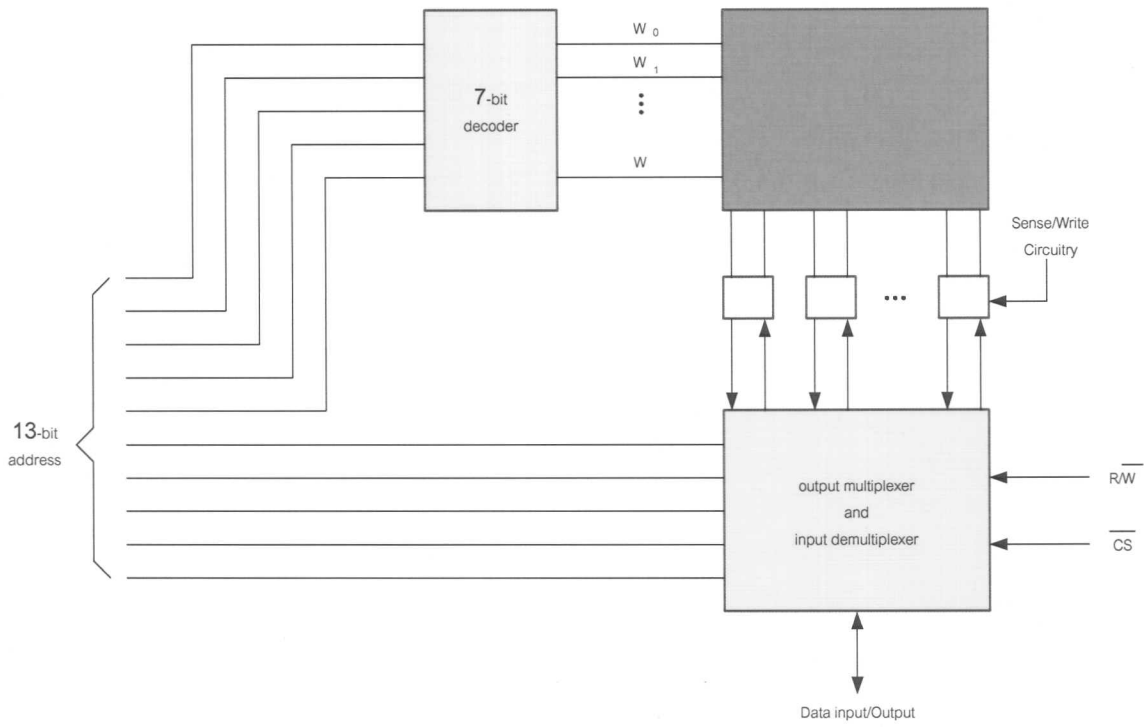
15. Why "Refresh circuit" is the most important of DRAM? (1 point)

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16. Please descript the Transistor1 to Transistor 6 in case of logic **1** and **0** recordings (1 point)
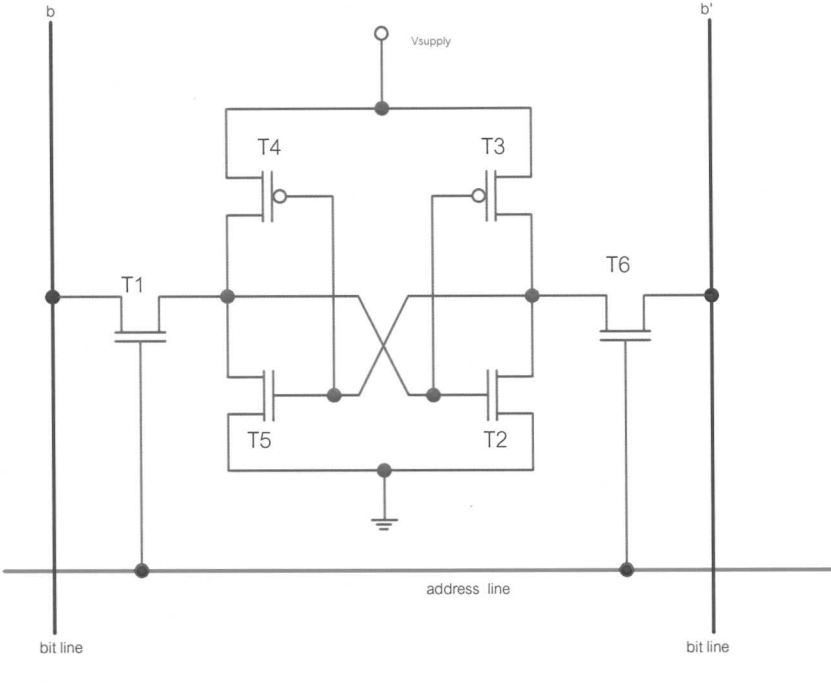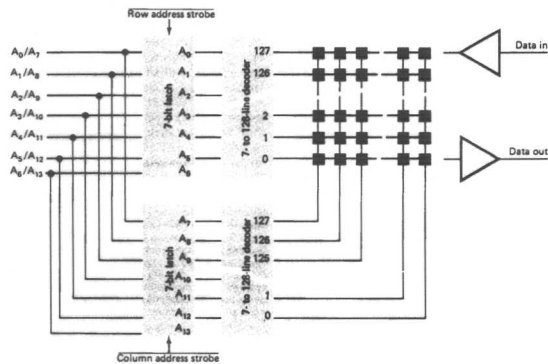

17. DRam, Please explain the **address lines, bit lines, transistor and capacitor** working in case of logic **1** and **0** recordings   (1 point)
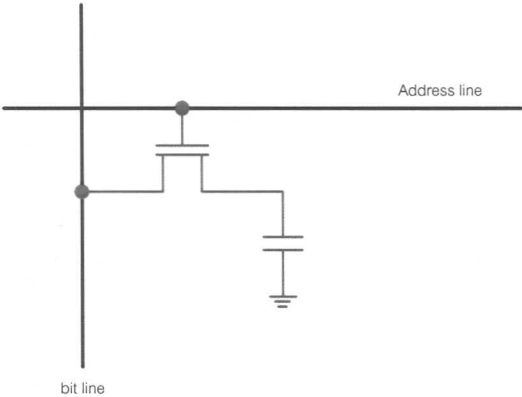
18. SDRAM, Please explain meaning of t_{CL} and t_{RCD} (1 point)

19. Please explain the advantages and disadvantage of **Multiplexed Row-Column addressing** (1 point)

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20. What is the main advantage of Fast Page Mode (FPM) in DRAM? (1 point)

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21. From this table, it is memory (4 bits) in memory (1 points)

   21.1. Is it right or wrong?

   21.2. If it is wrong, please use SEC-DED to fix it.

bit number	7	6	5	4	3	2	1	0
position number	111	110	101	100	011	010	001	000
	D4	D3	D2	C4	D1	C2	C1	P

D=1100
C=011
P=0

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22. Please explain the interrupt working "Daisy chain"   (1 points)

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23. External Memory   (15 points)
    a) Explain how data is written onto a magnetic disk

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    b) Define the terms track, cylinder and sector

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    c) Define the terms seek time, rotational delay, access time and transfer time

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d) Explain what is meant by the term RAID. List one advantage and one disadvantage of a RAID system.

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24. Input/Output   (15 points)

There are three input output techniques: Programmed I/O, Interrupt Driven I/O and Direct Memory Access. Explain the detailed sequence of events to perform each I/O operation

Programmed I/O

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Interrupt Driven I/O

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Direct Memory Access

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25. Computer Arithmetic   (20 points)

   a) Using binary number multiply 24 times 15 showing each step to obtain a final answer. Use 5 bits to set up the problem. How many partial product additions are required

   b) Use Booth's algorithm to perform the same multiplication and determine how many partial product additions are required