



KENYATTA UNIVERSITY

UNIVERSITY EXAMINATIONS 2011/2012

SECOND SEMESTER EXAMINATION FOR THE DEGREE OF BACHELOR
OF SCIENCE IN COMPUTER ENGINEERING

SCE 312: COMPUTER SYSTEMS ARCHITECTURE

DATE: Wednesday, 11th April, 2012

TIME: 11.00 a.m. – 1.00 p.m.

INSTRUCTIONS:

- (i) This paper contains **FIVE** questions.
 - (ii) Answer question **1** and any other **TWO** questions
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Question 1 (COMPULSORY)

- a) What has been the trend in computing from the following points of view
 - i) Cost of hardware (1 mark)
 - ii) Size of memory (1 mark)
 - iii) Speed of hardware (1 mark)
 - iv) Number of Processing elements (1 mark)
- b) Given the trend in computing in the last 20 years, What are your prediction for the future of computing? (3 marks)
- c) What is the positional representation of the decimal number 9 using 8 digits in base 2? (2 marks)
- d) Convert the decimal number 67.575 into binary (2 marks)
- e) List three methods for representing negative integers (3 marks)

f) Give three ways by which you can achieve overall improvement in speed and throughput of a memory system? **(6 marks)**

g) Explain why interface circuitry for DRAM is more complex than those used for SRAM. **(4 marks)**

h) By use of a diagram, briefly describe the computer memory hierarchy **(6 marks)**

Question 2:

a) Explain the following terms

i) Parallel processing **(2 marks)**

ii) Pipelining **(2 marks)**

iii) Dynamic execution **(2 marks)**

iv) Speculative execution **(2 marks)**

b) With regard to computer system board bus, explain function of the following terms *Master and Slave, Bus Protocol, Asynchronous Protocol, Bus Arbitration, Synchronous Protocol* **(5 marks)**

c) Explain the following addressing modes of the 8086, using illustrations where suitable; *Direct addressing, indirect addressing, indexed addressing and immediate addressing*, **(4 marks)**

c) What are some of the *advantages* and *disadvantages* of parallel processing? **(3 marks)**

Question 3:

a) Briefly explain the memory write operation (use a diagram in your explanation)? **(4 marks)**

b) Consider a computer that has a number of registers such that the three registers $R_0 = 1500$, $R_1 = 4500$ and $R_2 = 1000$. Give the result after the execution of each of the following instructions (assume that all numbers are decimal). Explain your answers in i) and ii)

i) *LOAD #5000, R₂* **(3 marks)**

ii) *ADD R₀, R₁, R₂* **(3 marks)**

c) What are the main principles used to construct a RISC machine? **(4 marks)**

- d) Contrast the two approaches (the software and the hardware) used in RISC machines to minimize memory operations.

(6 marks)

Question 4:

- a) Discuss the following Bus standards giving in each case, the peripheral devices that may use these standards: ISA, EISA and PCI

(4 marks)

- b) Give the block diagram for the PCI local bus architecture .

(2 marks)

- c) What features make PCI a preferred local bus standard?

(4 marks)

- d) Why is SCSI preferred for high performance IBM and other non 8086 families such as APPLE and SUN

(3 marks)

- e) Briefly compare and contrast the USB and the IEEE 1394

(4 marks)

- f) The bus bandwidth or throughput can be defined as the rate at which data is transferred from the Master to Slave or vice versa. List three factors that impact on the bus bandwidth

(3 marks)

Question 5:

- a) Consider having a program that runs in 50 s on computer A, which has a 500 MHz clock. We would like to run the same program on another machine, B, in 20 s. If machine B requires 2.5 times as many clock cycles as machine A for the same program, what clock rate must machine B have in MHz?

(4 marks)

- b) Compute the decimal value of the binary number 1011 1101 0101 0110

if

- i) The given number represents unsigned integer. **(2 marks)**

- ii) Repeat if the number represents 2's complement. **(3 marks)**

- iii) What if the number represents sign-magnitude integer.

(3 marks)

- c) M.J Flynn considers the organization of a computer into four major groups: SISD, SIMD, MISD and MIMD. Give a brief discussion of each group?

(8 marks)

