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UNIVERSITY REGULAR EXAMINATIONS
2013 /2014 ACADEMIC YEAR

FOR THE DEGREE OF

B.Sc.(Computer Science), B.Sc. (IT), B.Sc.(Mathematics), B.Ed.(Science)

CSC 120: COMPUTER ORGANIZATION

BIT 114: COMPUTER ORGANIZATION AND ARCHITECTURE

DATE: 15TH APRIL, 2014   **TIME:** 9:00A.M. – 12 NOON
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Instructions to Candidates

Answer questions ONE and any other TWO questions.

Question 1

a) State any TWO attributes of each of the following: computer organization and computer architecture? (4 marks)

b) Describe the features of a von Neumann computer architecture. (4 marks)

c) Explain the difference between ASCII and EBCDIC. (4 marks)

d) Name TWO ways in which signed integers can be represented in digital computers and explain the differences. (4 marks)

e) Explain the difference between hardwired control and micro-programmed control. (4 marks)

f) Name three different types of buses and state the function of each one. (3 marks)

g) Explain how programmed I/O is different from interrupt-driven I/O. (4 marks)

h) State any THREE limitations of a computer that has no operating system? (3 marks)

Question 2

a) Explain what is meant by the complement of an integer? Add 9_{10} to -23_{10} using two's complement arithmetic. (6 marks)

b) Why do we usually store floating-point numbers in normalized form? What is the advantage of using a bias as opposed to adding a sign bit to the exponent? (8marks)

c) Find the quotient and remainder when 1001011_2 is divided by 1011_2. (6 marks)

Question 3

Given the function

$$F(x,y,z) = x\overline{y}z + \overline{x}\,\overline{y}\,z + xyz$$

a) List the truth table for F. (4 marks)
b) Draw the logic diagram using the original Boolean expression. (4 marks)
c) Simplify the expression using Boolean algebra and identities. (4 marks)
d) List the truth table for your answer in Part c. (4 marks)
e) Draw the logic diagram for the simplified expression in Part c. (4 marks)

Question 4

a) Explain the steps in the fetch-decode-execute cycle. Your explanation should include what is happening in the various registers. (8 marks)

b) Explain what the CPU should do when an interrupt occurs. Include in your answer the method the CPU uses to detect an interrupt, how it is handled, and what happens when the interrupt has been serviced. (6 marks)

c) Several design decisions exist with regard to instruction sets. Name and explain four. (6 marks)

Question 5

a) If you are a computer builder trying to make your system as price-competitive as possible, what features and organization would you select for its memory hierarchy? (8 marks)

b) Consider a byte-addressable computer with 24-bit addresses, a cache capable of storing a total of 64KB of data, and blocks of 32 bytes. Show the format of a 24-bit memory address for direct mapped. (6 marks)

c) Direct memory access (DMA) is one of the I/O control methods. Explain how DMA works. (6 marks)