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First Semester MCA Degree Examination, February 2013
Fundamentals of Computer Organization

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions.

- 1 a. i) $(123.12)_{10} = (?)_2$ ii) $(123.12)_8 = (?)_{16}$ iii) $(101101.11)_2 = (?)_{10}$
iv) $(A35.B)_{16} = (?)_{10}$ v) $(123.12)_{10} = (?)_8$ vi) $(6BCD)_{16} = (?)_8$ (12 Marks)
b. List and explain basic gates. (05 Marks)
c. Construct a logic circuit using basic gates for $Z = \overline{(A + B + \overline{C} D \overline{E}) + \overline{B} C \overline{D}}$ (03 Marks)
- 2 a. Simplify the following expressions : i) $Y = \overline{A} B + A + \overline{A} B$ - using Boolean laws
ii) $Z = \overline{C}(\overline{A} B \overline{D} + D) + A \overline{B} C + \overline{D}$ - using K - map. (06 Marks)
b. Explain binary addition - subtraction logic network for signed numbers. (08 Marks)
c. Explain how the performance of the system can be improved with the help of basic performance equation. (06 Marks)
- 3 a. Explain full subtractor using two half subtractors, with neat sketch. (08 Marks)
b. With neat diagram, explain how the instruction Add R_0, R_1 is executed by the computer. (The diagram showing connection between processor and memory). (08 Marks)
c. What are condition code flags? Explain. (04 Marks)
- 4 a. Write a program to evaluate the expression $Z = (A * B) + (C * D)$ using one - address, two - address and three - address instruction format. (06 Marks)
b. Registers R_1 and R_2 of a computer contain the decimal value 1200 and 4600. What is EA of the memory operand in each of the following instructions? i) Load $20(R_1), R_5$
ii) Move # 2000, R_5 iii) Store $R_5, 30(R_1, R_2)$ iv) Subtract $(R_1) +, R_5$. (08 Marks)
c. Explain the Big - Endian and Little - Endian assignments for byte and word addressing, with neat diagram. (06 Marks)
- 5 a. Why bus arbitration is required? Illustrate the two approaches of bus arbitration. (10 Marks)
b. Explain the I/O techniques in which CPU is not continuously involved in data transfer. (10 Marks)
- 6 a. Explain the direct mapped cache and associative mapping, with a neat diagram. (10 Marks)
b. Explain the internal organization of $2M \times 8$ memory chip with neat diagram. (10 Marks)
- 7 a. Explain Booth's algorithm to multiply two signed numbers, with example $(+13) \times (-6)$. (08 Marks)
b. Explain integer division, with neat diagram for circuit arrangement for binary division. Explain the algorithms for restoring and non - restoring division method. (12 Marks)
- 8 Write short notes on :
a. Assembler Directives b. IEEE floating point standards
c. Virtual memory d. NAND gate as universal gate. (20 Marks)