First Semester MCA Degree Examination, December 2011

Fundamentals of Computer Organization

Time: 3 hrs. Max. Marks:100

Note: *Answer any FIVE full questions.*

1 a. Perform the following conversions:
   $(125)_{(10)} = ($? $)_{(2)}$ $(124)_{(8)} = ($? $)_{(2)}$
   $(A2)_{(16)} = ($? $)_{(2)}$ $(15B)_{(16)} = ($? $)_{(8)}$
   $(125)_{(8)} = ($? $)_{(16)}$ **(05 Marks)**

   b. Explain bit, byte, nibble and word size. Give examples. **(04 Marks)**

   c. i) Implement the Boolean function F = AB using only OR and NOT gates.
      ii) Implement the Boolean function F = A + B using only AND and NOT gates. **(06 Marks)**

   d. What is meant by universal gate? Give the circuit for XOR and NOR using NAND gates.
   (05 Marks)

2 a. Simplify the following using K-map :
   $F = A'B'C'D' + ABCD + A'B'C'D + ABCD' + A'BC'D + ABC'D + AB'C'D' + AB'CD$
   $+ AB'C'D + AB'CD'$
      i) Write the simplified minterm Boolean expression
      ii) Realize the same using NAND gates. **(10 Marks)**

   b. What is full adder? Give the truth table, logical expression for sum and carry, and implement
   it using NAND gates. **(10 Marks)**

3 a. With a neat diagram, explain the basic functional units of a computer. **(10 Marks)**
   b. Explain the basic performance equation. **(04 Marks)**
   c. With an example, explain pipelining and superscalar operation. **(06 Marks)**

4 a. Explain big-endian and little-endian assignments. **(04 Marks)**
   b. Explain different addressing modes. **(10 Marks)**
   c. Explain basic instruction types. **(06 Marks)**

5 a. Briefly explain centralized and distributed bus arbitration. **(10 Marks)**
   b. Explain how to handle simultaneous interrupt requests when multiple devices are used.
   (05 Marks)
   c. Explain briefly the synchronous bus. **(05 Marks)**

6 a. With a neat diagram, explain the internal organization of 2M × 8 dynamic memory chip.
   (10 Marks)
   b. Explain the mapping functions. **(10 Marks)**

7 a. Apply Booth's algorithm and bit pair recording of multipliers for multiplying 13 × -6
   example. **(10 Marks)**
   b. Explain nonrestoring division, with an example. **(10 Marks)**

8 Write short notes on :
   a. Three-bit adders   b. Direct memory accesses
   c. Read-only memories   d. IEEE standard for floating-point numbers. **(20 Marks)**

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