USN ☐☐☐☐☐☐☐☐☐☐   **13MCA13**

1   a.   Convert the decimal number 250 to base 2, base 4, base 8 and base 16.   **(08 Marks)**

     b.   i)   Find the 1's and 2's complement of the following binary numbers
               a. $(0111000)_2$ b. $(10000)_2$.   **(02 Marks)**

        ii)   Find the 9's and 10's complement of the following decimal numbers
               a. 09900   b. 13579.   **(02 Marks)**

     c.   Represent the decimal number 8620 in i) BCD; ii) excess – 3; iii) 2421;   iv) binary.
               (08 Marks)

2   a.   Reduce the following Boolean expressions to the required number of literals:

        i) $[(CD)' + A]' + A + CD + AB$ to three literals.

        ii) $(A + C + D)(A + C + D')(A + C' + D)(A + B')$ to four literals.   **(06 Marks)**

     b.   Simplify the following Boolean function using the K-map method:

        i) $D(A' + B) + B'(C + AD)$

        ii) $A'B'C'D' + A(C'D') + B'CD' + A'BCD + BC'D$ **(10 Marks)**

     c.   Simplify the following function and implement the same using NAND gates:
        $F = AC' + ACE + ACE' + A'CD' + A'D'E'$.   **(04 Marks)**

3   a.   Discuss in detail the design of a full adder using two half adders.   **(10 Marks)**

     b.   Discuss in detail the design of 3 to 8 line decoder.   **(10 Marks)**

4   a.   Draw the logic diagram and discuss the working of a Master-Slave JK flipflop using NAND
        gates.   **(10 Marks)**

     b.   Discuss in detail the working of 4-bit synchronous binary counter.   **(10 Marks)**

5   a.   i)   Explain in detail the connection between memory and the processor.   **(06 Marks)**

        ii)   Explain any two assembler directives.   **(04 Marks)**

     b.   i)   Explain how the performance of the system can be improved with the help of basic
            performance equation.   **(06 Marks)**

        ii)   What is a bus? Explain single bus structure.   **(04 Marks)**

6   a.   Define addressing modes. Discuss the various addressing modes used in modern processors.
               (10 Marks)

     b.   Explain in detail the different ways of assigning byte address across the word.   **(05 Marks)**

     c.   Write notes on condition codes.   **(05 Marks)**

7   a.   What is an interrupt? Explain how multiple devices are handled in interrupts.   **(10 Marks)**

     b.   What is bus arbitration? Explain the two approaches used for bus arbitration.   **(10 Marks)**

8   a.   Explain the internal organization of $2M \times 8$ dynamic memory chip.   **(10 Marks)**

     b.   Discuss in detail any two mapping function used in cache memory.   **(10 Marks)**

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