ICS Assignment Solution 1

Name: _____ ID: _____

1. (B)In a computer, the _____ subsystem serves as a manager of the other subsystems.

   (A) ALU (B) control unit (C) input/output (D) memory

2. (D)A step-by-step solution to a problem is called _____.

   (A) a computer language (B) hardware (C) an operating system
   (D) an algorithm

3. (A)When converting a decimal integer to base b, we repeatedly _____ b.

   (A) divide by (B) multiply by (C) add to (D) subtract from

4. (B)When converting a decimal fraction to base b, we repeatedly _____ b.

   (A) divide by (B) multiply by (C) add to (D) subtract from

5. (B)Which of the following represents the largest number?

   (A) $(11101001)_2$ (B) $(FA)_{16}$ (C) $(342)_8$ (D) 246

6. Explain the octal system. Why is it called *octal*? What is the base in this system?
   Sol:
   The octal system is a positional number system that uses eight symbols to represent a number. The word octal is derived from the Latin root *octo* (eight) or *octalis* (related to eight). In the octal system, the base is 8.

7. What is the function of the ALU subsystem in a computer?
   Sol:
   The arithmetic/logic unit (ALU) is where calculations and logical operations take place.

8. In a positional number system with base b, the largest integer number that can be respected using K digits is $b^K - 1$. Find the largest number in each of the following systems with *six* digits:

   (a) Binary

   (b) Decimal

   (c) Hexadecimal

   (d) Octal

   Sol:

   (a) binary: $2^6 - 1 = 63$

   (b) decimal: $10^6 - 1 = 999,999$

   (c) hexadecimal: $16^6 - 1 = 16,777,215$

   (d) octal: $8^6 - 1 = 262,143$

9. Convert the following numbers to decimal without using a calculator, showing your work:

   (a) $(35\text{E.E1})_{16}$

   (b) $(2731)_8$

   (c) $(011110.01)_2$

   Sol:

   (a) $(35\text{E.E1})_{16} = 3 \times 16^2 + 5 \times 16 + 14 \times 1 + 14 \times \frac{1}{16} + 1 \times (\frac{1}{16}^2) = 862.879$

   (b) $(2731)_8 = 2 \times 8^3 + 7 \times 8^2 + 3 \times 8 + 1 \times 1 = 1497$

   (c) $(011110.01)_2 = 1 \times 2^4 + 1 \times 2^3 + 1 \times 2^2 + 1 \times 2 + 0 \times 1 + 0 \times \frac{1}{2} + 1 \times (\frac{1}{2})^2 = 30.25$

10. A number less than b^K can be represented using K digits in base b. Show the number of digits needed in each of the following cases.

    (a) Integers less than 2^{14} in binary

    (b) Integers less than 10^8 in decimal

    (c) Integers less than 8^{13} in hexadecimal

    (d) Integers less than 16^4 in octal

    Sol:

    (a) 14

    (b) 8

    (c) $\log_{16} 8^{13} = \frac{39}{4} = 9.\cdots$
    Hence $K = 10$

    (d) $\log_8 16^4 = \frac{16}{3} = 5.\cdots$
    Hence $K = 6$