

# Assignment 1

Total: 75

Deadline: 22 February, 2025

**This assignment must be handwritten. Show ALL steps in ALL questions.**

1. [1.5+1.5 Marks] Convert the following decimal number to equivalent binary numbers:

(a)  $(4693.23450)_{10}$

(b)  $(4976.250363)_{10}$

**[for the infinite fractional part, just do 4-5 steps and use dots for the rest.]**

2. [1.5+1.5 Marks] Convert the following base 9 number to equivalent base 5 numbers:

(a)  $(8712)_9$

(b)  $(234.256)_9$

3. [1.5+1.5 Marks] Convert the following binary numbers to equivalent hexadecimal numbers:

(a)  $(101010101010)_2$

(b)  $(110101110111.1110101010111)_2$

4. [1.5+1.5 Marks] Convert the following binary numbers to equivalent octal numbers:

(a)  $(101010101010)_2$

(b)  $(110101110111.1110101010111)_2$

5. [1.5+1.5+1.5+1.5+1.5 Marks] Perform the following base conversions:

(a)  $(38A)_{13} = (?)_7$

(b)  $(10110111)_7 = (?)_4$

(c)  $(0011)_{BCD} = (?)_5$

(d)  $(0011)_{10} = (?)_{\text{Excess3}}$

(e)  $(110\ 0011)_{10} = (?)_{\text{Excess5}}$

6. [3+3+3+3 Marks] Perform **addition**, **subtraction**, **multiplication**, and **division** for the pair of following base-8 numbers. Verify your results by converting the problem into decimal.

Note: For division, 513 is dividend and 335 is divisor.

(a) 513

(b) 335

7. [3+3+3+3 Marks] Perform **addition**, **subtraction**, **multiplication**, and **division** for the pair of following base-6 numbers. Verify your results by converting the problem into decimal.

Note: For division, 214 is dividend and 115 is divisor.

(a) 214

(b) 115

8. [1.5 Marks]  $(010010101011111)_{2s} = (?)_{10}$

9. [1.5 Marks]  $(101010101000011)_{2s} = (?)_{10}$

10. [1.5 Marks]  $(010010101011111)_{1s} = (?)_{10}$

11. [1.5 Marks]  $(101010101000011)_{1s} = (?)_{10}$

12. [3 Marks] Subtract 13 from 27 in 7 bits using 2's complement number system and justify whether there is an overflow or not.

13. [3 Marks] Subtract 45 from 98 in 12 bits using 2's complement number system and justify whether there is an overflow or not.

14. [3 Marks] Add 13 with 27 in 6 bits using 2's complement number system and justify whether there is an overflow or not.

15. [3+3 Marks] Perform the following arithmetic operations using 13-bit two's complement and one's complement systems. State if there is an overflow in each case.

(a)  $91 - 499$

(b)  $379 + 98$

16. [10.5 Marks] You are a computer engineer and you want to buy two 8 GB DDR4 RAMs. Each RAM costs  $(1C2)_{16}$  dollars. You also want to buy a graphics card RTX4070Ti which costs  $(10010110000)_2$  dollars. However, you don't have that much money with you and you are afraid to ask your parents about it. Suddenly, one of your generous friends agreed to give you the money you need. He decided to give you  $(4064)_8$  dollars. How much will you have left after buying those components? **[Show the answer in decimal]**