COE 202, Term 081
Digital Logic Design
HW# 1

Q.1. Convert the following numbers from the given base to the bases indicated:

(i) Decimal 225.225 to binary, octal, and hexadecimal.

(ii) Binary 11010111.110 to decimal, octal, and hexadecimal.

(iii) Octal 623.77 to decimal, binary and hexadecimal.

(iv) Hexadecimal 2AC5.D to decimal, octal and binary.

(v) Hexadecimal EF.C to base 5.

(vi) Binary 1010101111.01101 to base 3.

(vii) Decimal 1223 to base 7.

Q.2. Perform the following arithmetic operations using the designated bases without converting to decimal. Verify your result by converting the numbers to decimal and then performing the operation in decimal:

(i) $(10111011)_2 - (01001111)_2$

(ii) $(1101)_2 * (1011)_2$

(iii) $(52E9)_{16} - (133F)_{16}$

(iv) $(54)_{16} * (20)_{16}$

(v) $(11011.0111)_2 + (11.1101)_2$

(vi) $(27.61)_{16} + (25.9F)_{16}$

Q.3. In each of the following cases, determine the radix r:

(i) $(121)_r = (25)_{10}$

(ii) $(345)_r = (180)_{10}$

Q.4. It is required to represent the number of students in the computer engineering dept. using binary numbers.

(i) If the current number of students is 370, what would be the required register size (how many bits)?

(ii) If the number of students will double every 2 years, how many bit would we need after 10 years?

Q.5. Find the 10`s complement of $(935)_{11}$.

Q.6. What is the minimum register size required to represent <u>both</u> these <u>signed</u> numbers in binary: +37.5 and –11.625? Do not forget to specify how many bits for the integer part and how many for the fractional part.

Fill the following table using the number of bits obtained above:

Representation	+37.5	–11.625
Signed Magnitude		
1's Complement		
2's Complement		

Perform the following operations using 1's complement and 2's complement representations above, indicating weather the result is positive, negative, or overflow:

- +37.5 – 11.625
- +37.5 + 11.625
- –37.5 – 11.625
- –37.5 + 11.625

Now fill the following table using **16-bits** representation; **8-bits** for the integer part and **8-bits** for the fractional part:

Representation	+37.5	–11.625
Signed Magnitude		
1's Complement		
2's Complement		

Q.7. Perform the following arithmetic operations using both r's and (r-1)'s complements and using the specified number of digits. Convert the result to sign-magnitude representation. Also, specify when an overflow condition has occurred:

(i) $(821)_{10} + (785)_{10}$ using 3-digits

(ii) $(821)_{10} + (785)_{10}$ using 4-digits

(iii) $(–A2B)_{16} + (–56C)_{16}$ using 4-digits

(iv) $(56C)_{16} – (A2B)_{16}$ using 4-digits

Q.8. A microcontroller uses 8-bit registers. Give the following in both binary and decimal:

(i) The maximum unsigned integer number that can be stored.

(ii) The smallest (negative) number and the largest (positive) number that can be stored using the sign-magnitude notation.

(iii) The smallest (negative) number and the largest (positive) number that can be stored using the 2`s complement notation.