School of Electrical Engineering and Computer Science
National University of Sciences & Technology (NUST)

<u>Practice Assignment No-1</u>

Subject:	**<u>Digital Logic Design</u>**	Course:	**<u>BEE-12CD</u>**
Teacher:	**<u>Engr. Arshad Nazir</u>**	Issue:	**<u>12 Oct 2021</u>**

✓ *This is a non-graded assignment aimed to enhance problem-solving skills of students from chapter1 of the textbook.*
✓ *The students are advised to attempt it at any time of their convenience.*

<u>Problem No-1</u> Which of the following are analog quantities, and which are digital?

  a. Number of atoms in a sample of material
  b. Altitude of an aircraft
  c. Timer settings on a microwave oven
  d. Temperature of a room
  e. Automobile fuel gauge
  f. A Ten-position switch
  g. Audio recording on CD
  h. Numerical readout of speedometer
  i. Switching of Torch light
  j. Seven colors of rainbow

<u>Problem No-2</u> Convert the following numbers from the given base to the indicated bases in the table:

<u>Decimal</u>	**<u>Binary</u>**	**<u>Octal</u>**	**<u>Hexadec</u>**
757.25	?	?	?
?	10110011101.11	?	?
?	?	7261.3	?
?	?	?	FACE. B

<u>Problem No-3</u> Perform the following conversions: -

  a. 757.25_{10} to Hexadecimal, Octal, and binary.
  b. $3BA.25_{14}$ to base6.
  c. $21CE_{16}$ to base7.

Problem No-4 Add, subtract, and multiply the following binary numbers: -

    a. 1111 and 1001
    b. 110010 and 11101

Problem No-5 In the given case, determine the radix r:

    a. $(365)_r = (302)_8$
    b. $(225)_r = (89)_{10}$

Problem No-6 Given the signed decimal numbers; X= −27 and Y= −997. Perform BCD addition using 10's complement method. Convert the answer in Sign-magnitude, Sign-1's complement, and Sign-2's complement form.

Problem No-7 Given the two unsigned numbers $X=761_8$ and $Y=775_8$:

    a. Perform subtraction X−Y using 9's complement.
    b. Redo it for Y−X and convert the answer to binary.

Problem No-8 Given the numbers $X=84_{10}$ and $Y=26_{10}$. Perform the following arithmetic operations in BCD using 10's complement method

    a. X+Y Unsigned numbers
    b. (−X) − (+Y) Signed numbers
    Verify your answer in decimal.

Problem No-9 Show the bit configuration that represents the decimal number 365 in:

    a. BCD Code
    b. 2-out-of-5 code
    c. Excess-3
    d. 6,3,1,-1
    What do you mean by self-complementing codes? Whether any of above codes is self-complementing, specify?

Problem No-10 Construct a 7,3,2,1 code for base-12 digits. Write B4A9 using this code.

Problem No-11 Perform subtraction on the given unsigned numbers using the 2's complement method

    35372_8 -131502_6

    Convert the answer in Hexadecimal.

Problem N0-12 Convert the following signed decimal numbers to BCD and perform addition and subtraction: -

    -97_{10} and $+965_{10}$

Problem No-13 There is considerable evidence to suggest that base-20 has historically been used for number of systems in several cultures:

   a. Write the digits for base-20 system, using an extension of the same digit representation scheme employed for hexadecimal.
   b. Convert $(2011)_{10}$ to base-20.
   c. Convert $(BEE.1)_{20}$ to decimal.

Problem No-14 Given the two unsigned numbers $X=761_8$ and $Y=2205_6$:

   c. Perform subtraction X-Y using 2's complement.
   d. Convert Base-12.
   e. Express the result in 10-bit signed-magnitude, signed-two's complement, and signed-one's complement forms.

Problem No-17 Because A−B=A+(−B), the subtraction of signed numbers can be accomplished by adding the complement. Subtract the given binary numbers by adding the complement of the subtrahend to the minuend. Indicate when an overflow occurs. Assume that negative numbers are represented in 2's complement.

   a. 01001−11010
   b. 11010−11001

   Convert your answer in decimal.

Problem No-18 Given the signed numbers $X=+458_{10}$ and $Y= -480_{10}$, perform addition X+Y in BCD using 10's complement method.

Problem No-19 Write your following biodata in ASCII using an 8-bit code with odd parity: -

   Regn No.
   Name.
   Course/Section.
   Contact No.
   E-mail address.

Problem No-20 Assume a 3-input OR gate with output F and a 3-input NAND gate with output G. Inputs are A, B, and C. Show the signals (by means of a timing diagram) of the outputs F and G as functions of the three inputs ABC. Use all possible combinations.

Problem No-21 A video camera is placed over a disc driven by a moving shaft of a motor. The camera could be rotated 360 degrees in steps of 10 degrees. The angular position is detected by employing Gray code.

Each 10-degree step is taken as one sector. How many bits will be needed to code each sector? Write down first twenty Gray codes for the sectors.

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