EC-121 Digital Logic Design
Quiz # 1 — Section A
(Solution)

Q - 1 A wireless weather station measures a number of weather parameters at an outdoor site and transmits them for display to an indoor base station.

a) What is the minimum number of bits that is required to represent humidity 98 in binary?

Sol:

2	98
2	49 - 0
2	24 - 1
2	12 - 0
2	6 - 0
2	3 - 0
	1 - 1

Minimum 7 bits are required to present humidity.

$(98)_{10} = (1100010)_2$

b) Convert pressure 49 mb in decimal to binary, octal, and hexadecimal.

Sol:

2	49
2	24 - 1
2	12 - 0
2	6 - 0
2	3 - 0
	1 - 1

$(49)_{10} = (110001)_2$

8	49
8	6 - 1

$(49)_{10} = (61)_8$

16	49
16	3 - 1

$(49)_{10} = (31)_{16}$

c) There is a need to transmit pressure value to the base station. Convert $(255)_{10}$ in ASCII with odd parity.

Sol:

$(255)_{10} = (0110010\ 0110101\ 0110101)_{ASCII}$

$= (\mathbf{00110010\ 10110101\ 10110101})_{\mathbf{ASCII\_ODD}}$

d) The system administrator wants to calculate the difference in temperatures in binary representations; $(100110)_2$ — $(10010)_2$ using signed 2's complement representation.

Sol:

Verify that number of bits of both Minuend and Subtrahend must be equal.

Minuend (M) = 100110 = -26
Subtrahend (S) = **1**10010 = -14 —> bit expansion by adding 1 at MSb.
Negation (-S) = 001110 = 14

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  1 0 0 1 1 0
+ 0 0 1 1 1 0
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  1 1 0 1 0 0
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Most significant bit shows that result is negative, so
Take 2's complement of 110100 = 001100 = 12
$(100110)_2 - (110010)_2 = (110100)_2$