**1**. Determine the decimal values of the following unsigned numbers.

1. **(10100111)2** = (1)\*20 + (1)\*21 + (1)\*22 + (0)\*23 + (0)\*24 + (1)\*25 + (0)\*26 + (1)\*27 = 167
2. **(2017)8**= (7)\*80 + (1)\*81 + (0)\*82 + (2)\*83 = 1,039
3. **(EFA4)16** = (4)\*160 + (10)\*161 + (15)\*162 + (14)\*163 = 61,348
4. **(CED192A11)16** = (1)\*160 + (1)\*161 + (10)\*162 + (2)\*163 + (9)\*164 + (1)\*165 + (13)\*166 + (14)\*167 + (12)\*168 = 55,517,456,913

**2**. All numbers below are in 8-bit 2’s complement. Perform operations shown. Indicate if

overflow occurs, and show remedy for the overflow.

1. **10001010 + 01110110** =
2. **01011010 – 10011010** = =
3. **11110111 + 11101010** =
4. **00101111 – 11110000** = =
5. **11011010 – 10011010** = = ­­­

For addition overflow, either another register can track overflow or an overflow flag can be raised.

**3**. Function f(a, b, c, d) is described below. **A)** Show a complete list of prime implicants of this function in the cubical form. **B)** Show essential prime implicants of f in the cubical form. **C)** Write all possible minimal realizations of f(a, b, c, d) in SOP form.

**D)** Show minimal circuit realization using 2- or 3-input NAND gates.

f (a, b, c, d) = Sm (2, 3, 4, 9, 11, 12, 13, 14), d(5,6)

1. Prime Implicants

|  |  |  |  |
| --- | --- | --- | --- |
| 0 | 1 | 1 | 0 |
| 0 | x | 1 | 1 |
| 1 | 0 | 0 | 1 |
| 1 | x | 1 | 0 |

1. Essential Prime Implicant

|  |  |  |  |
| --- | --- | --- | --- |
| 0 | 1 | 1 | 0 |
| 0 | x | 1 | 1 |
| 1 | 0 | 0 | 1 |
| 1 | x | 1 | 0 |

|  |  |  |  |
| --- | --- | --- | --- |
| 0 | 1 | 1 | 0 |
| 0 | x | 1 | 1 |
| 1 | 0 | 0 | 1 |
| 1 | x | 1 | 0 |

1. SOP

Fout = A’B’C+AB’D+BCD’ +BC’

Fout = A’B’C+AB’D+BC’D +BD’

1. Minimal realization using NAND gates

