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Group: TXL22S1-B

1. **Binary arithmetic**
   1. Tell if the following computations can be performed using 8-bit unsigned numbers – you don’t need to give the result, just state if it is possible or not. If calculation is not possible state reason why.
      1. 27 + 55 → Possible
      2. 13 – 19 → Result is signed number → Impossible
      3. 39 – 16 → Possible
      4. 359 – 219 → 359 and 219 can’t be represented in 8-bit → Impossible
      5. 192 + 71 = 263 → Can’t be presented in 8-bit → Impossible
      6. 42 + 33 → Possible
   2. Convert the following hexadecimal numbers to decimal.
      1. 0x19 = 1 ∙ 161 + 9 ∙ 160 = 25
      2. 0x100 = 1 ∙ 162 = 256
      3. 0xBEEF = 11 ∙ 163 + 14 ∙ 162 + 14 ∙ 161 + 15 ∙ 160 = 48879
      4. 0xACE = 10 ∙ 162 + 12 ∙ 161 + 14 ∙ 160 = 2766
      5. 0x2022 = 2 ∙ 163 + 2 ∙ 161 + 2 ∙ 160 = 8226
      6. 0xAC0DE5 = 10 ∙ 165 + 12 ∙ 164 + 13 ∙ 162 + 14 ∙ 161 + 5 ∙ 160 = 11275749
   3. Convert following base-10 numbers to binary and calculate using 2-complement arithmetic. Remember: 𝑃 − 𝑄 = 𝑃 + (−𝑄). Use enough bits so that no overflow occurs. State the minimum number of bits needed for each assignment.
      1. 67 – 5

→ Minimum number of bits: 8

* + 1. 123 + 998 – 754 = 1121 – 754

→ Minimum number of bits: 12

* + 1. 45 – 124

→ Minimum number of bits: 8

* + 1. -78 – 23

→ Minimum number of bits: 8

* 1. Assume that following numbers are all signed 16-bit numbers that have been written with hexadecimal digits.

A = 0xABBA = 1010 1011 1011 1010 → -A = 0101 0100 0100 0110

B = 0x0ACE = 0000 1010 1100 1110 → -B = 1111 0101 0011 0010

C = 0x1974 = 0001 1001 0111 0100 → -C = 1110 0110 1000 1100

Calculate the following and indicate if an overflow occurred in the calculation:

* + 1. A + B

→ No overflow occured

* + 1. C – A

→ No overflow occured

* + 1. B + C

→ No overflow occured

* + 1. A – C

→ No overflow occured