L1 Data Representation Quiz ANS

1. Which hex digit corresponds to the 4-bit pattern 1101?  
   A. 0xB  
   B. 0xC  
   C. 0xD  
   D. 0xE

ANS: C

1. Convert 10110₂ to decimal:  
   A. 20  
   B. 22  
   C. 18  
   D. 26

ANS: C (16+4+2=22)

1. In a 5-bit system, adding 28 and 6 sets which condition?  
   A. No flags set  
   B. Carry flag set  
   C. Overflow flag set  
   D. Zero flag set

ANS: B (true sum 34 exceeds 2⁵−1=31)

1. In a 5-bit system, 3 − 5 results in which carry/borrow status?  
   A. Carry=1 (Borrow=0)  
   B. Carry=0 (Borrow=1)  
   C. Carry=1 (Borrow=1)  
   D. Carry=0 (Borrow=0)

ANS: B (result −2 < 0 ⇒ borrow; on M3, Carry=NOT Borrow ⇒ C=0)

1. On ARM Cortex-M3, the borrow and carry flags relation is:  
   A. Carry = Borrow  
   B. Carry = NOT Borrow  
   C. Borrow always 0  
   D. Carry always 0

ANS: B

1. In two’s complement, TC(x) can be obtained by:  
   A. Invert bits  
   B. Invert bits and subtract one  
   C. Invert bits and add one  
   D. Add one then invert bits

ANS: C

1. In a 5-bit system, which statement is true about −16 (10000₂)?  
   A. Its two’s complement is 00000₂  
   B. Its two’s complement is itself  
   C. It cannot be represented  
   D. It equals +16

ANS: B (most negative number maps to itself)

1. Signed overflow can occur when:  
   A. Adding operands with different signs  
   B. Subtracting operands with the same sign  
   C. Adding two negatives  
   D. Subtracting a negative from a negative never overflows

ANS: C (same-sign add or different-sign subtract can overflow)

1. In CPSR after ADD/SUB, which flag denotes carry?  
   A. N  
   B. Z  
   C. C  
   D. V

ANS: C (C for carry)

1. In a 5-bit system, to compute a+b for a=0b10000 and b=0b10000, software should check which flag if a,b are unsigned vs. signed, respectively?  
   A. Unsigned→V, Signed→C  
   B. Unsigned→C, Signed→V  
   C. Unsigned→N, Signed→Z  
   D. Unsigned→Z, Signed→N

ANS: B (unsigned uses C; signed uses V)

**Explanations:** For a = 0b10000 and b = 0b10000 in a 5-bit context, software should check the C flag for unsigned addition and the V flag for signed addition, respectively.

**Unsigned case**

- Treating a and b as unsigned 16 and 16, the true sum is 32, which exceeds the 5-bit unsigned max 2^5-1=31; therefore the carry flag C is set to indicate unsigned overflow.

- Conclusion: check C for unsigned a + b; C=1 here because the true result > 2^n-1.

**Signed case**

- Treating a and b as signed −16 and −16 (since 0b10000 is the most negative value in 5-bit two’s complement), the true sum is −32, which is below the signed minimum -2^{4}=-16; this sets the overflow flag V for signed overflow.

- Conclusion: check V for signed a + b; V=1 here because the true result < -2^{n-1}.

1. In a 5-bit system, the same binary addition can represent both unsigned 23+6=29 and signed −9+6=−3 because:  
   A. Adder interprets sign automatically  
   B. Two’s complement allows the same hardware; interpretation differs in software  
   C. Hardware selects mode via a pin  
   D. Only subtraction shares hardware

ANS: B

1. For char str = "ARM Assembly", what must the final byte be and what is the string’s size in Bytes?  
   A. 0x00; 13   
   B. 0x20; 12   
   C. 0x41; 13  
   D. 0x79; 12 (ASCII hex code for lowercase ‘y’ is 0x79)

ANS: A (includes space for NULL terminator; 12 chars + 1 NUL = 13)