

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
2. Convert 10110_2 to decimal:
A. 20
B. 22
C. 18
D. 26
ANS: C ($16+4+2=22$)
3. 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 $2^5-1=31$)
4. 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 $-2 < 0 \Rightarrow$ borrow; on M3, Carry=NOT Borrow \Rightarrow C=0)
5. 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
6. 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
7. In 5-bit two's complement, which statement is true about -16 (10000_2)?
A. Its two's complement is 00000_2
B. Its two's complement is itself
C. It cannot be represented
D. It equals $+16$
ANS: B (most negative number maps to itself)
8. 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)

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

ANS: C (C for carry)

10. 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 \rightarrow V, Signed \rightarrow C
 - B. Unsigned \rightarrow C, Signed \rightarrow V
 - C. Unsigned \rightarrow N, Signed \rightarrow Z
 - D. Unsigned \rightarrow Z, Signed \rightarrow 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 $< -2^{n-1}$.

11. 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

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

ANS: A (string needs NUL; 12 chars + 1 NUL = 13)