

## Lesson 03 - Data Representation

### MCQ Answers

|    |   |    |   |    |   |    |   |    |   |
|----|---|----|---|----|---|----|---|----|---|
| 01 | 3 | 02 | 5 | 03 | 1 | 04 | 2 | 05 | 3 |
| 06 | 4 | 07 | 1 | 08 | 2 | 09 | 4 | 10 | 1 |
| 11 | 3 | 12 | 1 | 13 | 2 | 14 | 2 | 15 | 3 |
| 16 | 2 | 17 | 5 | 18 | 1 | 19 | 5 | 20 | 2 |
| 21 | 5 | 22 | 3 | 23 | 1 | 24 | 3 | 25 | 5 |
| 26 | 3 | 27 | 4 | 28 | 4 | 29 | 2 | 30 | 2 |
| 31 | 4 | 32 | 4 | 33 | 4 | 34 | 3 | 35 | 1 |
| 36 | 4 | 37 | 5 | 38 | 3 | 39 | 3 | 40 | 3 |
| 41 | 2 | 42 | 2 | 43 | 4 | 44 | 4 |    |   |

### Structure Essay Answers

01.  $5 = 00000101$   
 $3 = 00000011$   
 $-3 = 11111100$  (one's complement) (01 mark)  
 $+ 00000001$   
 $11111101$  (two's complement) (01 mark)

$5 + (-3)$   
 $00000101$   
 $+ 11111101$   
 $\boxed{1} \quad 00000010$   
 ↑  
 Carry bit

- The carry out of the most significant bit is ignored in two's complement addition. (01 mark) (2011)

02.  $15 = 00001111$   
 $5 = 00000101$  (01 mark)  
 $-5 = 11111010$  (one's complement)  
 $+ 00000001$   
 $11111011$  (two's complement) (01 mark)

$15 + (-5)$   
 $00001111$   
 $+ 11111011$   
 $\boxed{1} \quad 00001010$   
 ↑  
 Carry bit

- The carry out of the most significant bit is ignored in two's complement addition. (01 mark) (2012)

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03.

(a)  $13 = 00001101$   
 $19 = 00010011$   
 $-19 = 11101100$  (one's complement)  
 $\quad \quad \quad \underline{00000001} +$   
 $\quad \quad \quad 11101101$  (two's complement) (03 marks)

(b)  $13 + (-19)$   
 $\quad \quad \quad 00001101$   
 $\quad \quad \quad + 11101101$   
 $\quad \quad \quad \underline{\hspace{1cm}}$   
 $\quad \quad \quad 11111010$  (01 mark)

- (c) Identify the sign of the final decimal number by looking at the most significant bit (MSB) of the given binary number.
- If the MSB is "0" sign is Positive (+)  
 If so just convert to decimal (01 mark)
  - If the MSB is "1" Sign is negative (-)  
 Get the binary number.  
 Invert bit value  
 Add 1 to least Significant bit (LSB)  
 Convert the number to decimal (01 mark)  
 (2013)

04. One's complement of 0001 is 1110

$\therefore 1110 + 0001 = 1111$

$\therefore$  Two's complement of 0001 = 1111

$\therefore$  Negative of 0001 = 1111

(03 marks)  
 (2014)

05.

(a) 00001010  
 (b)  $25 = 00011001$   
 $-25 = 11100110$  (one's complement)  
 $\quad \quad \quad \underline{00000001} +$   
 $\quad \quad \quad 11100111$  (two's complement)

(c)  $10 + (-25)$   
 $\quad \quad \quad 10 = 00001010$   
 $\quad \quad \quad -25 = \underline{11100111} +$   
 $\quad \quad \quad \underline{11110001}$

- (d) Check the most significant bit  
 If it is 0, the sign is positive, just convert.  
 the number to decimal. (Optional)  
 It is 1 the sign is negative, perform the 2's complement

(01 mark)  
 (2015)

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06.

(a)  $12_{10} = 00001100_2$  (01 mark)

(b)  $68_{10} = 01000100_2$   
 $-68_{10} = 10111011_2$  (one's complement)  
 $+ 00000001_2$  (01 mark)  
 $10111100_2$  (two's complement)

(c)  $12 + (-68)$   
 $00001100$   
 $+ 10111100$   
 $11001000$  (01 mark)

- (d) (Write one out of these) (01 mark)  
(2018)
- More efficient calculations
  - Possible to represent negative number
  - Subtractions are carried out as additions
  - has only one value for zero

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