MODULE C DATA REPRESENTATION · C5

Binary addition and overflow

Original practice questions · 20 marks · ~25 minutes · OCR J277 spec 1.2.4

Name _____ Date _____

Instructions. Answer all questions in the spaces provided. No calculator. All numbers are unsigned (positive) 8-bit binary. When you add, show your carries: converting to denary and back does not count as binary working. The marks for each part are shown in brackets [ ]. The total for this worksheet is **20 marks**.

1

Total: 2 marks

(a) State the result of adding the binary digits 1 + 1, written as a 2-bit binary number. **[1]**

(b) State the largest denary number that can be stored in 8 bits. **[1]**

2

Total: 2 marks

(a) Add the binary numbers 00110101 and 01001110. Show your working. Use the grid. The dashed column on the left is for any carry out of the 128 column. **[2]**

	128	64	32	16	8	4	2	1	
	0	0	1	1	0	1	0	1	
	0	1	0	0	1	1	1	0	+
									Answer
									Carries

3

Total: 7 marks

A ticket gate in a railway station counts people in an 8-bit register. Every hour the gate adds the new count to a running total.

(a) Add the binary numbers 10010110 and 00111011. Show your working. **[2]**

	128	64	32	16	8	4	2	1	
	1	0	0	1	0	1	1	0	
	0	0	1	1	1	0	1	1	+
									Answer
									Carries

(b) Later the gate adds the binary numbers 11001100 and 01010101. Add them. Show your working. **[2]**

	128	64	32	16	8	4	2	1	
	1	1	0	0	1	1	0	0	
	0	1	0	1	0	1	0	1	+
									Answer
									Carries

(c) State the type of error that happens in the addition in part (b). **[1]**

(d) Explain why this error happens in part (b). **[2]**

4

Total: 4 marks

(a) Each row shows an addition of two 8-bit binary numbers. Tick (✓) **one** box in each row to show whether the addition causes an overflow error in 8 bits. **[4]**

Addition	Overflow error	No overflow error
01111111 + 00000001		
10000000 + 10000000		
01010101 + 00101010		
11110000 + 00010001		

5

Total: 2 marks

(a) A warehouse scanner adds two 8-bit numbers. The answer is 11110000, but one bit of each number has been smudged (shown as ?). **[2]**

Write the missing bit of each number so that the addition is correct.

128	64	32	16	8	4	2	1	
0	1	0	1	?	0	1	0	
1	?	0	1	0	1	1	0	+
1	1	1	1	0	0	0	0	Answer

First number missing bit: ..... Second number missing bit: .....

6

Total: 3 marks

A fitness tracker stores the number of floors climbed in a day in an 8-bit register.

(a) A user climbs 140 floors in one day, then the tracker adds another 120. Describe what goes wrong with the stored total and what effect this could have for the user. **[3]**

Total for this worksheet: 20 marks