MODULE C DATA REPRESENTATION · C5

Binary addition and overflow

Original practice questions · 21 marks · ~25 minutes · Cambridge 0478 syllabus 1.1.4

Name _____ Date _____

Instructions. Answer all questions in the spaces provided. No calculator. All numbers are positive 8-bit binary integers. Where a question says "You must show all your working", show your carries in the grid. The marks for each part are shown in brackets [ ]. The total for this worksheet is **21 marks**.

1

Total: 4 marks

(a) State the largest denary value that can be stored in an 8-bit register. **[1]**

(b) Add the two positive 8-bit binary integers 01100111 and 00011101 using binary addition. Give your answer in binary. You must show all your working. Use the grid. The dashed column on the left is for any carry out of the 128 column. **[3]**

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

2 **Total: 6 marks**

A car park barrier stores the number of cars that have entered in an 8-bit register. At midday it adds the morning count to the overnight count.

(a) Add the two positive 8-bit binary integers 10111010 and 01011011 using binary addition. Give your answer in binary. You must show all your working. **[4]**

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

(b) An overflow error occurs in the addition in part (a). Explain why the overflow error occurs. **[2]**

3 **Total: 4 marks**

(a) Tick (✓) **one** box in each row to show whether each statement is true or false. **[4]**

Statement	True	False
An overflow error occurs if the result of an addition is greater than 255 in an 8-bit register		
Adding two 8-bit integers that both have 0 as the most significant bit can cause an overflow error		
A 16-bit register can store the value 300 without an overflow error		
When an overflow error occurs, the correct result is still stored in the 8-bit register		

4 **Total: 3 marks**

(a) A device uses 16-bit registers. State the largest denary value it can store in one register. **[1]**

(b) A computer or device has a predefined limit that it can represent or store. Explain what is meant by an overflow error, using this limit. **[2]**

5 **Total: 4 marks**

(a) Add the two positive 8-bit binary integers 01110101 and 00101011 using binary addition. Give your answer in binary. You must show all your working. **[3]**

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

(b) Convert your answer to part (a) into denary. **[1]**

Total for this worksheet: 21 marks