MODULE C DATA REPRESENTATION · C7

Two's complement

Original practice questions · 22 marks · ~25 minutes · Cambridge 0478 syllabus 1.1.6

Name _____ Date _____

Instructions. Answer all questions in the spaces provided. No calculator. All binary numbers on this worksheet are **8-bit two's complement** integers. The marks for each part are shown in brackets [ ]. The total for this worksheet is **22 marks**.

1

Total: 3 marks

(a) State the denary place value of the most significant bit in an 8-bit two's complement integer. **[1]**

(b) State the smallest and the largest denary values that can be stored as an 8-bit two's complement integer. **[2]**

Smallest: .....

Largest: .....

2

Total: 4 marks

(a) Convert the two's complement integer **01011010** to denary. **[1]**

Answer: .....

(b) Convert the two's complement integer **10110101** to denary. Show your working. **[2]**

Working space

Answer: .....

(c) Convert the two's complement integer **11111111** to denary. **[1]**

Answer: .....

3 Total: 5 marks

(a) Convert the denary integer **77** to an 8-bit two's complement integer. **[1]**

−128	64	32	16	8	4	2	1

(b) Convert the denary integer **−77** to an 8-bit two's complement integer. **[2]**

Working space

−128	64	32	16	8	4	2	1

(c) Convert the denary integer **−19** to an 8-bit two's complement integer. Show your working. **[2]**

Working space

Answer: .....

4 Total: 4 marks

A freezer controller stores each temperature reading, in °C, as an 8-bit two's complement integer.

(a) One reading is stored as **11110110**. An engineer says the reading is 246 °C. Explain why the engineer is wrong and give the correct reading. **[2]**

(b) Explain why the controller cannot store a reading of 150 °C. **[2]**

5 Total: 3 marks

(a) Tick (✓) **one** box in each row to show whether each statement about 8-bit two's complement integers is true or false. **[3]**

Statement	True (✓)	False (✓)
Every negative integer has a 1 as its most significant bit		
10000000 represents the denary value 0		
A positive integer is stored the same way as in 8-bit binary with no sign		

6 **Total: 3 marks**

(a) Describe how a negative denary integer is converted to an 8-bit two's complement integer. **[3]**

Total for this worksheet: 22 marks