

Conversions and Arithmetic

CHAPTER 5: Binary Conversions

PASTPAPERS

N.B. These pastpapers may rely on the knowledge gained from the previous chapters.

1 SEC'95-PAPER 1-Q5

- (a) A computer uses 8-bit two's complement numbers. In the space below fill in the largest positive binary number that can be represented in this computer. [2]

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- (b) Give the value to base 10 of the binary number you wrote above: [2]

- (c) Show how an 8-bit computer using two's complement arithmetic calculates $37-121$ (BASE 10) and get -84 (BASE 10) as an answer. [5]

2 SEC'96-PAPER 1-Q2c (CONSULT CH 4)

How much storage is required for a single pixel in a display supporting up to 256 colours?

[5]

3 SEC '96-PAPER 1-Q5

(a) Complete each row of the table to show the same number in binary, hexadecimal and decimal.

BINARY	=	HEXADECIMAL	=	DECIMAL									
1	0	1	1	0	1	0	1	=			=		
								=	F	8	=		
								=			=	74	[2x3]

(b) In a particular computer, positive numbers are represented as 8-bit quantities.

i. What is the biggest number that can be stored in this way? [1]

ii. Give an example of an arithmetic operation which would cause a NUMERIC OVERFLOW error in your computer [1]

4 SEC'97-PAPER 1-Q7

Complete each row of the table to show the same number in binary, hexadecimal and decimal:

BINARY								HEXADECIMAL		DECIMAL		
0	1	1	0	1	0	1	1	=		=		[2]

								=	A	E	=		[2]
--	--	--	--	--	--	--	--	---	---	---	---	--	-----

								=		=	92	[2]
--	--	--	--	--	--	--	--	---	--	---	----	-----

Working for question :

6 SEC '98-PAPER 1-Q7

Complete each row of the table to show the same number in binary, hexadecimal and decimal.

BINARY	=	HEXADECIMAL	=	DECIMAL									
0	1	0	1	0	0	1	0	=			=		[2]
								=	C	A	=		[2]
								=			=	100	[2]

8 SEC '99-PAPER 1-Q8

Complete each row of the table to show the same number in binary, hexadecimal and decimal.

BINARY								HEXADECIMAL		DECIMAL			
0	0	1	1	0	1	1	1	=			=		[2]

								=	E	B	=		[2]
--	--	--	--	--	--	--	--	---	----------	----------	---	--	-----

								=			=	93	[2]
--	--	--	--	--	--	--	--	---	--	--	---	-----------	-----

9 SEC '00-PAPER 1-Q6

Complete each row of the table to show the same unsigned number in binary, hexadecimal and decimal.

BINARY								HEXADECIMAL		DECIMAL		
1	0	1	0	1	1	0	1	=		=		[2]

								=	F	0	=		[2]
--	--	--	--	--	--	--	--	---	---	---	---	--	-----

								=			=	24	[2]
--	--	--	--	--	--	--	--	---	--	--	---	----	-----

Working for question :

10 SEC '00-PAPER 2A-Q4C Part A (CONSULT CH 2)

A computer uses two's complement code to store integer numbers.

(a) Explain why internal code representations are binary-based. [1]

A storage location within this computer has the following binary bit pattern in it:

01011010

i. What signed decimal number does this binary bit pattern represent? [1]

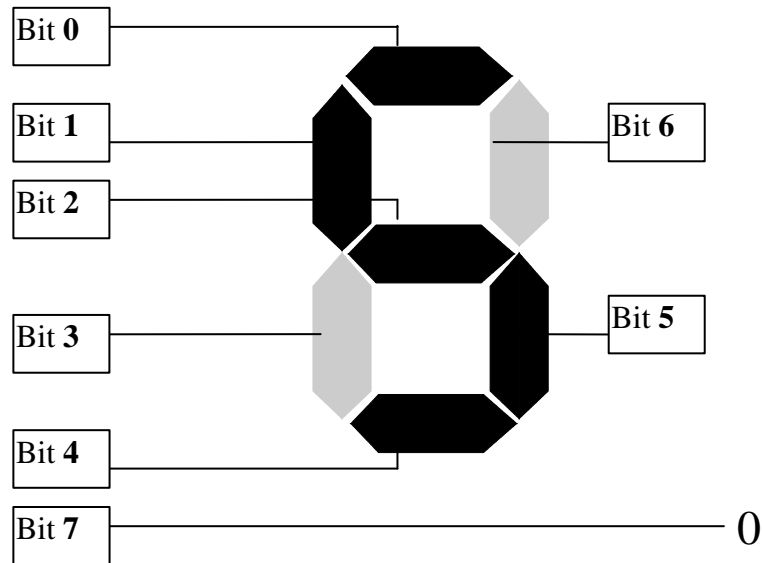
ii. Use two's complement arithmetic to subtract the number 11100110 from 01011010. [2]

iii. What would be the outcome if 10000110 when subtracted from 01011010? [3]

iv. Name two other possible things a binary bit pattern may represent. [2]

11 SEC '01-PAPER 1-Q7

An LCD display is made of seven segments as shown below. To display digits, the correct segments have to be switched on. A byte of data is sent to the LCD such that each bit controls one segment with the exception of bit 7 (the most significant each byte). If a bit is 1, the segment is switched on. If a bit is 0, the segment is switched off. Assume bit 7 is always set to zero. To display the digit 5 shown below the following byte of data 00110111 is sent to the LCD.



(a) Convert the following numbers into binary ACCORDING TO THEIR BASE and state which digits are displayed on the LCD by writing the corresponding values in the table below. The first one is worked out for you. Show your working. [4]

Number	Base	Binary	Display
55	Decimal	00110111	5
127	Decimal		
96	Decimal		
66	Hexadecimal		
75	Hexadecimal		

(b) Why are memory locations often represented in hexadecimal rather than binary in printouts of sections of memory?

_____ [2]

12 SEC '02-PAPER 1-Q7

Complete each row of the table to show the same unsigned number in binary, hexadecimal and decimal.

BINARY									HEXADECIMAL		DECIMAL	
1	1	0	0	1	0	1	1	=			=	
								=	5	F	=	
								=			=	99

[6]

14 SEC '03-PAPER 1 Q6

These questions relate to an 8-bit unsigned register.

a. Represent the decimal number 81 as an unsigned binary number.

.....
.....
.....

[2]

b. How is the hexadecimal number A1 represented in this register?

.....
.....
.....

[2]

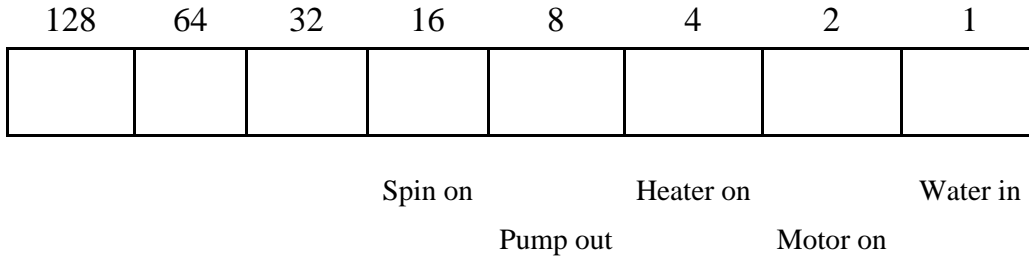
c. What is the biggest number which can be stored in this register?

.....
.....
.....

[2]

16 SEC '04-PAPER 1 Q10

10. Below is a diagram of an output port on a washing machine, e.g. when the number 24 (00011000) is output the machine is instructed to spin and to pump out water.



a. What happens when 7 is output ?

b. What happens when 3 is output?

c. What value (in decimal) must be output to have both the spin and heater on and everything else off?

[6]

17 SEC '05-PAPER 1 Q6

(a) Fill in the following table:

Decimal number	8-bit unsigned binary number	Hexadecimal number
105		
	11011110	
		C0

[6]

(b) Why are hexadecimal numbers used in Computing?

[2]

Answer the following questions on data representation.

(a) What decimal number is represented by each of the following unsigned numbers:

(i) 01101001_2

(ii) $B4_{16}$

Ans: _____

Ans: _____

[2]

(b) What is the maximum unsigned number that may be represented in an 8-bit register?

[2]

(c) Given that an 8-bit register stores the bit pattern 01101001, what bit pattern will it hold after two right shifts?

[2]

(d) Given that an ASCII-type coding system codes the (capital) letter A with the decimal number 73, what decimal number is used to code the (capital) letter K?

[1]

(e) Why is it desirable to have standard character coding systems?

[2]

19 SEC '07-PAPER 1 Q6

Given an 8-bit register used to store unsigned numerical data in binary equivalent code:

- a) Write down the bit pattern of the register when representing the unsigned number **12**.

_____ [2]

- b) Write down the bit pattern of the register after a shift one right operation is performed on this register (which stores the unsigned number 12).

_____ [2]

- c) What effect does this shift one right operation have on the unsigned number stored in the register.

_____ [2]

- d) Confirm your answer by converting your answer to part (b) to its decimal equivalent

_____ [2]