

S1 – Key to Examination 1

Computer Architecture

Duration: 1 hr 30 min.

Family name: First name: Class:

Answer on the worksheet

Do not show any calculation unless you are explicitly asked.

Do not use a pencil or red ink.

Exercise 1 (5 points)

Convert the following numbers from the source form into the destination form. Do not write down the result in a fraction or a power form (e.g. write down 0.25 and not $\frac{1}{4}$ or 2^{-2}). Write down the result only (do not show any calculation).

Number to Convert	Source Form	Destination Form	Result
11011011	Binary	Decimal	219
1DB	Hexadecimal	Decimal	475
147	Decimal	Binary	10010011
524	Decimal	Hexadecimal	20C
11001.1011	Binary	Decimal	25.6875
25.B	Hexadecimal	Decimal	37.6875
57.48	Decimal	Binary (5 digits after the point)	111001.01111
18.24	Decimal	Hexadecimal (3 digits after the point)	12.3D7
DC.81	Hexadecimal	Binary	11011100.10000001
1010100.10111	Binary	Hexadecimal	54.B8

Exercise 3 (5 points)

Perform the following 8-bit binary operations (the two operands and the result are 8 bits wide). Then, convert the result into unsigned and signed decimal values. If an overflow occurs, write down 'ERROR' instead of the decimal value.

Operation	Binary Result	Decimal Value	
		Unsigned	Signed
11010011 – 10011111	00110100	52	52
01101001 + 01101110	11010111	215	ERROR
01011010 – 10101110	10101100	ERROR	ERROR
11001000 – 11100010	11100110	ERROR	-26
01101111 + 10000001	11110000	240	-16

Exercise 4 (6 points)

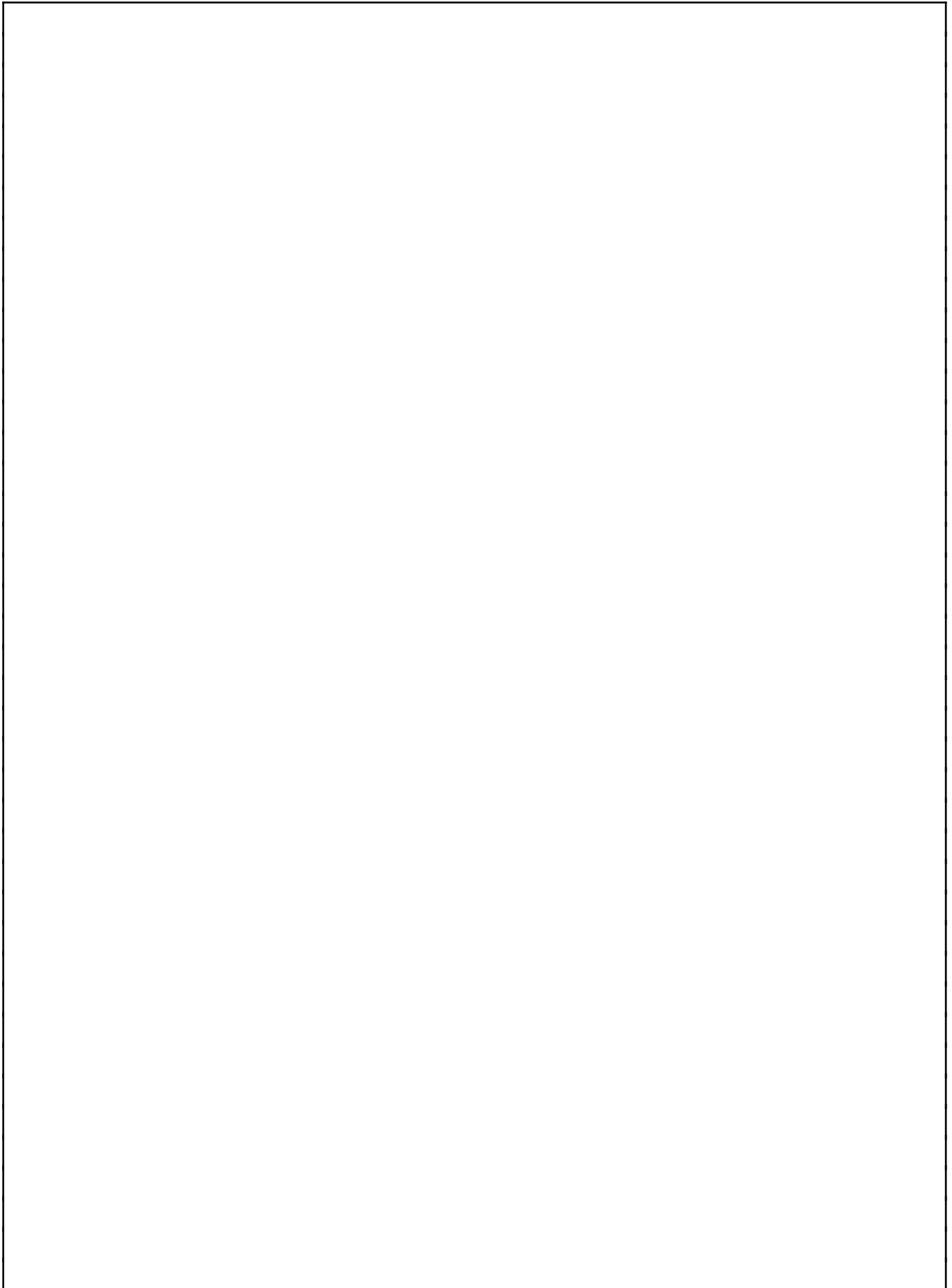
- Convert the numbers below into their **single-precision** IEEE-754 representations. Write down the final result in its **binary form** and specify the three fields.

Number	S	E	M
325	0	10000111	010001010000000000000000
67.375	0	10000101	000011011000000000000000
0.6875	0	01111110	011000000000000000000000

- Convert the **double-precision** IEEE-754 words below into their associated representations. If a representation is a number, use the base-10 following form: $k \times 2^n$ where k and n are integers (either positive or negative).

IEEE-754 Representation (base 16)	Associated Representation
3548 0000 0000 0000	3×2^{-172}
000A 8000 0000 0000	21×2^{-1027}
FFFF 0000 0000 0000	NaN

Feel free to use the blank space below if you need to:

A large, empty rectangular box with a thin black border, occupying most of the page. It is intended for the student to provide answers or show work during the examination.