Notre Dame University

Faculty of Applied and Natural Science

Computer Organization & Assembly Language. CSC 222

Midterm Exam

1. Answer by writing **True or False** in the corresponding box: *(8 Points)*

a) The content of register R1 changes after the register transfer: $R_2 \leftarrow R_1$	
b) A shift left operation multiplies a number by 2.	
c) When adding 2 signed numbers, having a carry also means having an overflow.	
d) You can never get an overflow with an arithmetic shift right operation.	

2. The binary values of register A=10001110 and B= 00110011. Write the register transfer language for each operation and show the corresponding results where applicable in the following table:
(20 points)

Operation	Register Transfer Language	Result of Operation
An Arithmetic shift left of Register A.		
Followed by a Circular shift right.		
Add A with B. (Result in A)		
OR A with B. (Result in A)		
	D $\leftarrow A + \overline{B}$	
	D $\leftarrow \overline{B} + 1$	

3. Perform the following conversions: *(20 points)*

Decimal	Binary	Hexadecimal	Octal	BCD
85.125				
		DC1.2E		

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4. Derive the following (r)'s complement and (r-1)'s complement for the following numbers:
(12 Points)

	r's Complement	**(r-1)'s complement**
$(6F14CD)_{16}$		
$(0100011)_2$		

5. Write the following numbers using *16 digits* in the following bases: use r's complement Notation! *(6 points)*

	Number	Result
Base 10	- 1786610	
Base 8	- 6542170	

6. Perform the subtractions with the following **SIGNED** numbers: *(10 points)*

$$\begin{array}{r} 9\ 9\ 0 \\ -2\ 7\ 0 \\ \hline \end{array} \qquad \begin{array}{r} 0\ 1\ 1\ 1 \\ -1\ 1\ 1\ 0 \\ \hline \end{array}$$

7. Draw the circuit diagram of a 4-bit shift circuit capable of circular shift-right and circular shift-left operations. *(12 points)*

8. Design a 4-bit incrementer/decrementer using full adders having a control signal M When M=0 circuit decrements, otherwise circuit increments. Explain your result. *(12 points)*

Good Luck!

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