

SAMPLE FINAL EXAM
EET 340 (Spring 2021)

Name:

1. (10 Points) Provide definition of the followings: a. Assembly language b. Machine Code

Solution:

Assembly language is a symbolic representation of machine instructions.

Programs written in the form of zeros and ones are called machine languages, because that is the version of the program that computer reads and follows.

2. (10 Points) Convert Decimal value to binary and then convert to hexadecimal value (Show the steps of calculation): 21_{10}

3. (15 Points) Translate the following LEGV8 assembly instruction into a machine instruction: `ADDI X9, X9, #1`

Instruction Format

opcode	immediate	Rn	Rd
10 bits	12 bits	5 bits	5 bits

Decimal Representation

580	1	9	9
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Binary Representation

1001000100	000000000001	01001	01001
10 bits	12 bits	5 bits	5 bits

$$1001000100000000000010100101001_2 = 91000529_{16}$$

4. (15 Points) Convert the following C++ code to LEGv8 Assembly code. Assume the variable a is in X22 and base address of array b is in X23.

```
for (i=0, i<a, i++)
{
    b[i] = a + i;
}
```

ADDI X9, XZR, #0	// Assuming i is in temp register X9
Loop: CMP X9, X22	// Check for i < a
B.GE Exit	// If true exit else continue
ADD X10, X22, X9	// Compute a + i
LSL X11, X9, #3	// Multiply i*8 for 64-bits
ADD X11, X23, X11	// Compute address for b[i]
STUR X10, [X11, #0]	// Store the a + i in b[i]
ADDI X9, X9, #1	// i++
B Loop	// Loop back
Exit:	

5. (10 points) What will be the decimal value of R1 and R9 after executing the following instruction.

```
MOV R9, #10
LSL R1, R9, #3
```

6. (15 Points) Convert following floating-point values to IEEE-754 single precision format. Convert the result in hexadecimal and show all the steps of calculation: 2.75

① Convert to binary: $0.75 * 2 = 1.5$
 $0.5 * 2 = 1.0$ } $\longrightarrow 10.11$

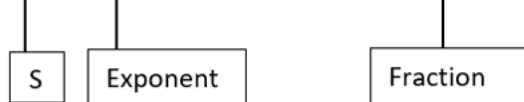
② Normalized: $1.011 * 2^1$

③ Calculation of the three components: $(-1)^S * (1 + Fraction) * 2^{(Exponent - Bias)}$

Single Precision:

S = 0;
 Fraction = 0.011;
 Bias = 127;
 Exponent = 128;

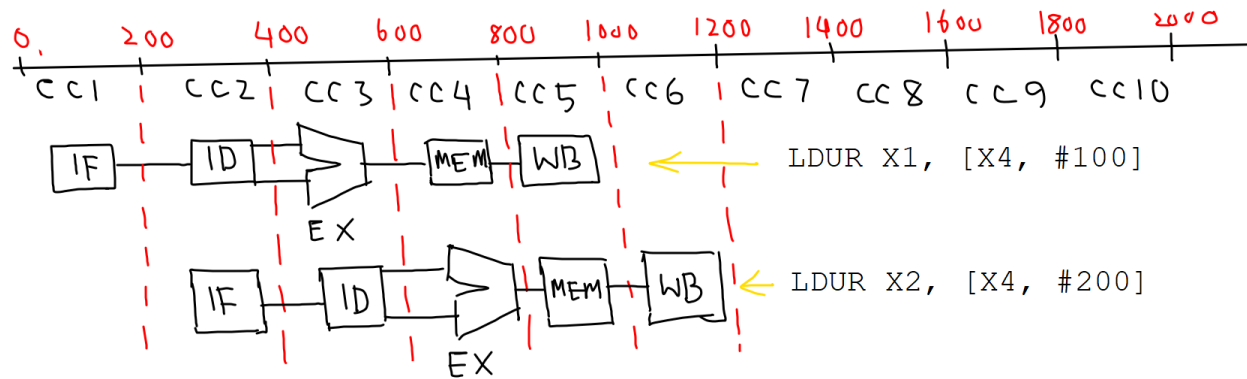
0, 1000, 0000, 0110, 0000, 0000, 0000, 0000, 000₂ = 0X40300000_{hex}



7. (10 Points) Draw the multicycle pipelined diagram for the following instructions.

LDUR X1, [X4, #100]

LDUR X2, [X4, #200]



8. (15 Points) Trace the data path taken by the following instruction using Datapath source diagram: ADD X4, X5, X6

