



EXAM I

110 MINUTES

WORK ALL PROBLEMS

OPEN BOOK

(35 pts)

1) Consider the following piece of EMY mnemonic machine language program :

40C000	LW	R8, 0(R11)	# R11 initially has 10000000
40C004	LW	R9, 2000(R11)	
40C008	LW	R10, 4000(R11)	
40C00C	ADD	R8, R8, R9	
40C010	ADD	R8, R8, R10	
40C014	SW	R8, 6000(R11)	
40C018	ADDI	R11, R11, 4	
40C01C	ADDI	R12, R12, (-1) ₁₀	# R12 is initially 1
40C020	BNE	R12, R0, (-9) ₁₀	
----	----		
10000000	6		
----	----		
10002000	8		
----	----		
10004000	C		

a) **Obtain** a table that shows the values of registers and memory locations used by the above piece of EMY code as shown in class. Also **show** the number of memory accesses made for each instruction.

Determine what this piece of code does. That is, what is its **purpose** ? Indicate it in **one** sentence.

b) **Invent** a new EMY instruction that implements the instructions in locations 40C000 through 40C014 above.

Indicate **only** the following : Its syntax, semantics, format and the memory accesses made.

Then, rewrite the above code starting at 40C000 so that the **new** EMY instruction is used.

Add comments to your code.

(55 pts)

2) Consider the following piece of EMY mnemonic machine language program :

```
400000 LW      R8, 5000(R9)      # R9 has 10000000 initially
400004 LW      R10, 0(R9)
400008 BEQ     R8, R10, 1
40000C ADDI    R11, R11, 1       # R11 is initially 0
400010 ADDI    R9, R9, 4
400014 ADDI    R12, R12, (-1)10  # R12 is initially 2
400018 BNE     R12, R0, (-7)10
40001C SW      R11, 0(R9)
----
10000000 2A
10000004 F2
----
10005000 91
10005004 7C
```

a) **Obtain** a table that shows the values of registers and memory locations used by the above piece of EMY code as shown in class. Also **show** the number of memory accesses made for each instruction.

Determine what this piece of code does. That is, what is its **purpose** ? Indicate it in **one** sentence.

b) **Invent** a new EMY instruction that implements the instructions in locations 400004 through 400008 above.

Indicate **only** the following : Its syntax, semantics, format and the memory accesses made.

Then, rewrite the above code starting at 400000 so that the **new** EMY instruction is used.

Add comments to your code.

(10 pts)

3) Convert the following **single-precision** IEEE-754-format FP number to a decimal number as shown **in class** such that all calculations are manual :

$$(1\ 10000010\ 111000000000000000000000)_{\text{IEEE-754}} = (?)_{10}$$

Make sure to show **all** the intermediate steps.