COA LAB
RISC PROCESSOR DESIGNING

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Encoding Scheme for Instructions:

1)

MSB LSB

XX (13 bits)	Source2 (5-bits)	Source1 (5-bits)	Destination-address (5 bits)	Opcode (4 bits)
19-31 bits	14-18 bits	9-13 bits	4-8 bits	0-3 bits

2)

Immediate Value (16 bits)	XX (Dont care) (2 bits)	Source1 (5-bits)	Destination-address (5 bits)	Opcode (4 bits)
16-31 bits	14-15 bits	9-13 bits	4-8 bits	0-3 bits

Assembler Table:

Assembly Instruction	OP-Code
Move (MOV)	0000
Move Immediate (MVI)	0001
Load	0011
Store	0101
Add	0110

Add Immediate (ADI)	0111
Subtract (SUB)	1000
Subtract Immediate (SUI)	1001
AND	1010
And Immediate (ANI)	1011
OR	1100
OR Immediate (ORI)	1101
HALT	1110

Addresses of Registers:

The Register file consists of 32 Registers. Hence 5-bits are required to denote address of registers.

Examples for addresses of registers:

1) Register R1 has an address of 00000.
2) R2's address is 00001 and so on.

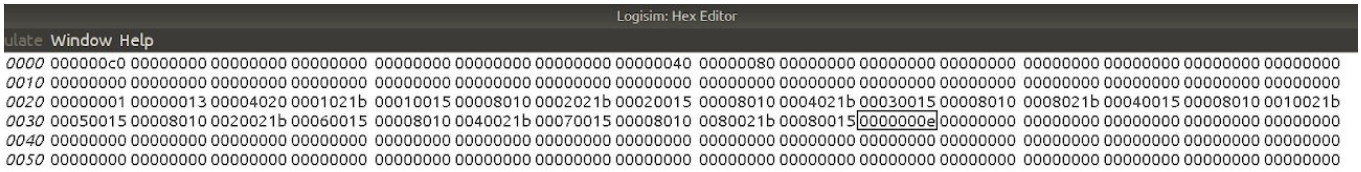
Encoding for Given Sample Codes:

1)

INSTRUCTION	Machine Code
MOVE R1, 00	0000 0001
LOAD R2, 0(R1)	0000 0013
MOVE R3, R2	0000 4020
ANI R2, R2, 1	0001 021B
STORE R2, 1(R1)	0001 0015
MOVE R2, R3	0000 8010

ANI R2, R2, 2	0002 021B
STORE R2, 2(R1)	0002 0015
MOVE R2, R3	0000 8010
ANI R2, R2, 4	0004 021B
STORE R2, 3(R1)	0003 0015
MOVE R2, R3	0000 8010
ANI R2, R2, 8	0008 021B
STORE R2, 4(R1)	0004 015
MOVE R2, R3	0000 8010
ANI R2, R2, 16	0010 021B
STORE R2, 5(R1)	0005 0015
MOVE R2, R3	0000 8010
ANI R2, R2, 32	0020 021B
STORE R2, 6(R1)	0006 0015
MOVE R2, R3	0000 8010
ANI R2, R2, 64	0040 021B
STORE R2, 7(R1)	0007 0015
MOVE R2, R3	0000 8010
ANI R2, R2, 128	0080 021B
STORE R2, 8(R1)	0008 0015
HLT	0000 000E

Output of Code: The code gives 40, 80 in hexadecimal which are 64, 128 in decimal



Note:
The above program was loaded at location 0020 and the data is located at 0000

2)

Instruction	Machine Code
MOVE R1, 00	0000 0001
LOAD R2, 0(R1)	0000 0013
LOAD R3, 2(R1)	0002 0023
ADD R4, R2, R3	0000 8236
SUI R4, R4, 1	0001 0639
STORE R4, 1(R1)	0001 0035
ADI R1, R1, 3	0003 0007
LOAD R2, 0(R1)	0000 0013
LOAD R3, 2(R1)	0002 0023
ADD R4, R2, R3	0000 8236
SUI R4, R4, 1	0001 0639
STORE R4, 1(R1)	0001 0035
MOVE R1, 00	0000 0001
LOAD R2, 1(R1)	0001 0013
LOAD R3, 4(R1)	0004 0023
OR R4, R2, R3	0000 823c
STORE R4, 6(R1)	0006 0035
HLT	0000 000E

Input:- 7 numbers (1,2,3,4,5,6,7) are given from Location 0000 - 0007
Output :- 1,3(1+3-1), 3, 4, 9(4+6-1), 6, B (3 or 9)

Note:- The program is loaded from 0080 location onwards.
The operations done are: e1=e0+e2-1
e4=e3+e5-1
e6=e1 or e4

Logisim Output: