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Digital Logic: Assn 6

Problem Set:

Chapter 6: 1-5

1) $2^{12} \times 64$ bit memory

# of signed nits

The range of signed Int data:

-2^{k-1} to $2^{k-1}-1$

-2^{12-1} to $2^{12-1}-1$

-2^{11} to $2^{11}-1$

-2048 to 2047

12 bits are needed to address every location in this memory

2)

a) The Program Counter is 4-bits

b) The memory address register is 4-bits

c) The Accumulator is 8-bits

d) The Instruction Register is 8-bits

3)

1 Gibibytes $= 1024^3$

4 Gibibytes $= 4 \cdot 1024^3$

$= 4,294,967,296$

$2^{32} = 4,294,967,296$

$\therefore 2^{32} = 4$ Gibibytes

32 address bits are needed for a 4 Gibibyte address space

4) Instruction Fetch TS + Instruction Exec TS for Mem Read

Control Code						Action
Inc	Amux	Mar	Mst	Ir	Acc	f(src) → dst
1	0	1	0	0	0	PC → Mar ; inc(PC)
0	–	0	0	1	0	Mem(Mar) → IR
0	1	1	0	0	0	IR → Mar
0	–	0	0	0	1	Mem(Mar) → Acc

5) Instruction Fetch TS + Instruction Exec TS for Mem Write

Control Code						Action
Inc	Amux	Mar	Mst	Ir	Acc	f(src) → dst
1	0	1	0	0	0	PC → Mar ; inc(PC)
0	–	0	0	1	0	Mem(Mar) → IR
0	1	1	0	0	0	IR → Mar
0	–	0	1	0	0	Acc → Mem(Mar)