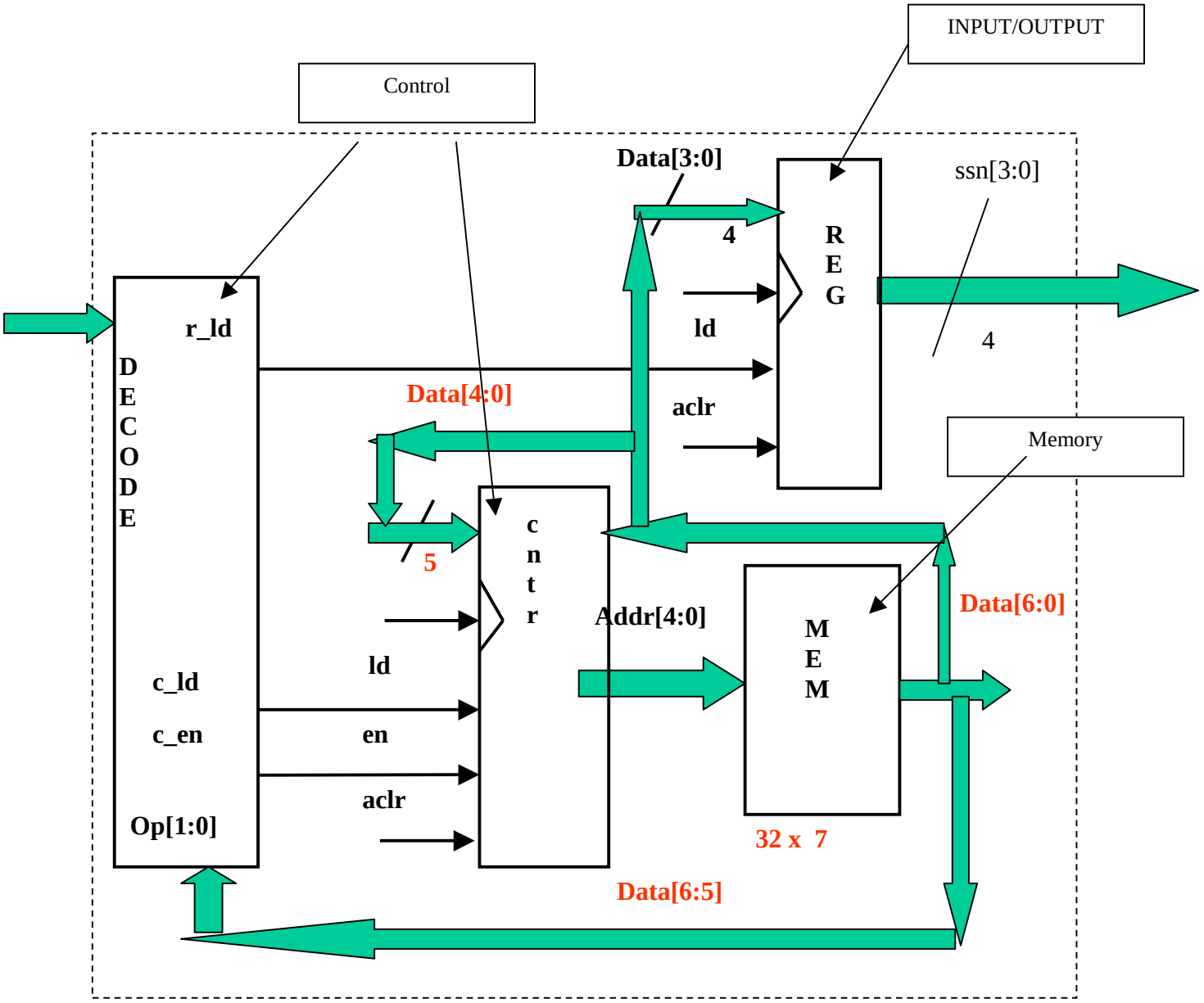
EE 3724 Test #1 Solutions- Fall '00 – Reese
Work all problems. Closed book, closed notes; You may use the supplied reference material.

1. (15 pts) The following is the a diagram of our SSN processor. **CLEARLY IDENTIFY (circling, labeling)** the following section general sections of the design as it relates to a general purpose processor:

   a. MEMORY
   b. CONTROL
   c. INPUT/OUTPUT



2. 15 pts. Memory devices:

a. How many address pins does a 128K x 16 memory have?
128K = 128 x 1K = 2^7 x 2^{10} so 7+10 = 17 address pins

b. How many data pins does a 128K x 16 memory have?
The x16 means 16 bits per location, so 16 data pins.

c. Which of the following instructions will cause the WRITE_ENABLE signal to a memory to be asserted during the memory access for one of the operands? (CIRCLE ONE OR BOTH).

mov ax, [bx+4]

mov [bx+4], bx

Memory write operation

d. Which of the following instructions will cause the OUTPUT_ENABLE signal to a memory to be asserted during the memory access for one of the operands? (CIRCLE ONE OR BOTH).

mov ax, [bx+4]

mov [bx+4], bx

Memory read operation

e. . Which of the following instructions will cause the CHIP_SELECT signal to a memory to be asserted during the memory access for one of the operands? (CIRCLE ONE OR BOTH).

mov ax, [bx+4]

mov [bx+4], bx

Chip select valid on Memory read or write operation

3. 5 pts What is the purpose of an opcode field in the binary format of processor instruction?
Contains the binary code of the particular instruction

4. 5 pts Explain the difference between the following two instructions. Give your answer in the form of Register Transfer Notation (RTL).

a. mov ax, [1000h] *ax ⇐ M[1000h] (Ax gets the contents of mem location 1000h)*

b. mov ax, 1000h] *ax ⇐ 1000h (Ax gets the contents of mem location)*

5. 5 pts Convert the decimal value -27 to a 16-bit 2'complement hex number.

Ignore sign. 27 = 1Bh . Need to take negative of this since original number of was zero. Subtract from 00. 00h – 1Bh = E5. Extend to 16 bits: FFE5.

6. 5 pts. The following number 84h represents a decimal number in 8 bit, 2's complement format. What is its decimal value?

*84h represents a negative number since MSB=1. Need to take negative to get positive magnitude. Subtract from 0. 00h - 84h = 7Ch. Convert to Decimal: 7 * 16 + 12 * 1 = 112+12 = 124. Number is -124.*

7. 15 pts.

Assume the following memory contents:

Address	Contents															
09A0:0000	C5	67	A5	00	12	BC	34	BB	F4	72	09	A3	29	01	D4	CE
09A0:0010	FE	89	02	D8	A4	8A	7C	DD	90	3C	9B	83	65	19	F6	8A
09A0:0020	A7	CC	9A	BD	8E	90	2C	00	1C	90	0E	13	8C	39	58	C6
09A0:0030	76	D7	CA	FF	D8	71	18	24	40	A8	2C	76	93	C5	0F	9E
09A0:0040	82	A6	54	2E	9A	20	0A	98	E4	A0	0E	25	38	29	2C	86

. Assume the following register contents:

DS: 09A1, SS: 09A2, ES: 09A1, BX= 000F, BP:0008, SI: 0008, DI:0004, CX: 0002

Give the final value of the affected register:

a) mov al, [BX] address is DS:BX = 09A1:000F = 09A0:001F, so al = 8A h.

b) mov ax, [BX-5] address is DS:BX-4 = 09A1:000A = 09A0:001A, ax = 839B h

c) mov dl, [BP+8] address is SS:BP+8 = 09A2:0010 = 09A0:0030, so dl = 76 h

8. 5 pts. For the register contents in the previous example, what is the 20-bit PHYSICAL address for DS:BX ??? DS:BX = 09A1:000F , so physical address is 09A1F.

9. 10 pts. Assume the following register contents:

Assume the following register contents:

DS: 09A1, SS: 09A2, ES: 09A1, BX= 000F, BP:0012, SI: 0008, DI:0004, CX: 0002

EAX = AA2387E4

Address	Contents															
09A0:0000																
09A0:0010																
09A0:0020														E4		
09A0:0030					E4	87										
09A0:0040																

Show how memory is modified for the following instructions:

a) mov [bp+2], ax address is SS:BP+2 = 09A2:0014 = 09A0:0034

b) mov [bx-2], al address is DS: BX-2 = 09A2:000D = 09A0:002D

10. 15 pts. For each of the following sums, indicate if unsigned overflow, signed overflow (two's complement) occur (neither, one or the other, or both)

Circle ONE answer

a. 85h + 10h (NEITHER) Only Unsigned overflow Only Signed Overflow Both

b. 20h + 30h (NEITHER) Only Unsigned overflow Only Signed Overflow Both

c. FFh + FFh NEITHER (Only Unsigned overflow) Only Signed Overflow Both

d. 70h + 20h NEITHER Only Unsigned overflow (Only Signed Overflow) Both

e. A0h + 80h NEITHER Only Unsigned overflow Only Signed Overflow (Both)

11. 5 pts. What is the ASCII code used for????
ASCII is a 7 bit code for the English alphabet + numbers, symbols, and printer control codes.

Explanations of a-e for problem 10.

a. 85h + 10h = 95h. Unsigned: no carry out, no overflow. Signed: Negative + Positive cannot overflow. So neither

b. 20h + 30h = 50h. Unsigned: no carry out, no overflow. Signed: Positive+Positive= Positive, no overflow. So neither.

c. FFh + FFh = FEh. Unsigned: Carry out, so overflow. Signed: Negative+Negative= Negative, no overflow. Only unsigned overflow.

d. 70h + 20h = 90h. Unsigned, no carry out. Signed: Positive+Positive = Negative, So overflow. Only signed overflow.

e. A0h + 80H = 20h. Unsigned, Carry out, so overflow. Signed: Negative + negative = Positive, so signed overflow. Both unsigned and signed overflow.