CS 4380 Projects (3 weeks)

Any instruction can be preceded by a label.
Random example of assembly code instructions:

```
COUNT  .INT  1
INDEX  .INT  0
NEXT   .INT  5
R      .BYT 'R'
A      .BYT 'A'
Y      .BYT 'Y'
START  LDR R0, COUNT
       LDR R1, INDEX
       ADD R1, R0
       STR R1, INDEX
       TRP 1
BEGIN  MOV R3, R0
       CMP R3, R5
       BNZ R3, BADX
       TRP 3
       TRP 0
```

Jump Instructions

Op Code	*Description*	*Operands*	*Value*
JMP	Branch to Label	Label	1
JMR	Branch to address in source register	RS	2
BNZ	Branch to Label if source register is not zero	RS, Label	3
BGT	Branch to Label if source register is greater than zero	RS, Label	4
BLT	Branch to Label if source register is less than zero	RS, Label	5
BRZ	Branch to Label if source register is zero	RS, Label	6

Move Instructions

Op Code	*Description*	*Operands*	*Value*
MOV	Move data from source register to destination register	RD, RS	7
LDA	Load the Address of the label into the RD register. This instruction should ONLY work if the label is associated with a DIRECTIVE. THIS command must NOT be used to get the address of an instruction.	RD, Label	8
STR	Store data into Mem from source register	RS, Label	9
LDR	Load destination register with data from Mem	RD, Label	10
STB	Store byte into Mem from source register	RS, Label	11
LDB	Load destination register with byte from Mem	RD, Label	12

Arithmetic Instructions

Op Code	*Description*	*Operands*	*Value*
ADD	Add source register to destination register, result in destination register	RD, RS	13
ADI	Add immediate data to destination register.	RD, IMM	14
SUB	Subtract source register from destination register, result in destination register	RD, RS	15
MUL	Multiply source register by destination register, result in destination register	RD, RS	16
DIV	Divide destination register by source register, result in destination register	RD, RS	17

Logical Instructions

Op Code	*Description*	*Operands*	*Value*
AND	Perform a boolean AND operation, result in destination register. This is a logical AND not a bitwise AND.	RD, RS	18
OR	Perform a boolean OR operation, result in destination register. This is a logical OR not a bitwise OR.	RD, RS	19

Compare Instructions

Op Code	*Description*	*Operands*	*Value*
CMP	Set destination register to zero if destination is equal to source; Set destination register to greater than zero if destination is greater than source; Set destination register to less than zero if destination is less than source.	RD, RS	20

Traps

Op Code	*Description*	*Operands*	*Value*
TRP	Execute an I/O trap routine (a type of operating system or library routine) using register R3. IMM Values 1, write integer to standard out 2, read an integer from standard in 3, write single character to standard out 4, read a single character from standard in Read or write a value from register R3.	IMM	21
TRP	Execute STOP trap routine. 0, stop program	IMM	21
TRP	DEBUG (OPTIONAL) IMM Value 99 If you use the TRP its output must be suppressed in the version of code you supply to me!	IMM	21

Directives

Directive	*Description*
.INT value	Allocate space for an integer. Example: MONTH .INT 12 DAY .INT 9 YEAR .INT 2005 STUFF .INT 9 .INT 17 .INT 42 .INT 53
.ALN	Align the next byte on a word boundary. (NOT USED)
.BYT value	Allocate space for one byte. Example: N .BYT 78 # Use the ascii code A .BYT 65 M .BYT 77 E .BYT 69 LETTER_A .BYT ‘A’ # Or use the character SCHOOL .BYT ‘U’ .BYT ‘V’ .BYT ‘U’

Registers

Register	*Description*	*Value*
R[0…7]	General purpose integer registers named R0 through R7	0, 1, 2, 3, 4, 5, 6, 7
PC	Program Counter, can't move a value into this register from a MOV instruction but you can copy its value to another register.	8