

Chapter 6 Key: 4, 5, 7, 9, 12, 15, 16

4. Assume that memory cells 60 and 61 and register R currently have the following values: Register R: 13, 60: 472, 61: -1

Using the instruction set in Figure 6.5, what is in register R and memory cells 60 and 61 after completion of each of the following operations? Assume that each instruction starts from the above conditions.

<<technically all these statements would generate a symbol not found error – however I believe the author ignoring that for this problem – therefore a correct answer will either be errors (if the student explains) or the following answers>>

	R	60	61
Initial Values	13	472	-1
a	472	472	-1
b	13	13	-1
c	485	472	-1
d	13	472	-1
e	13	472	50
f	13	472	-1

5. Assume that memory cell 79 contains the value +6. In addition, the symbol Z is equivalent to memory location 79. What is placed in the register R by each of the following load commands?

- a) 6 <<could also be error – symbol not found>>
- b) Error <<symbol 6 not found in symbol table>>
- c) 6
- d) 7

7. What is the assembly language equivalent of each of the following binary machine language instructions?

- a) 0101001100001100 → 0101 001100001100 : SUBTRACT (512 + 256 + 8 + 4) = SUBTRACT 780
- b) 0011000000000111 → 0011 000000000111 : ADD (4 + 2 + 1) = ADD 7

9. Using the instruction set shown in Figure 6.5, translate the following algorithmic primitives into assembly language code. Show all necessary .DATA pseudo-ops.

a)

	LOAD	K
	ADD	THREE
	STORE	K
	HALT	
THREE:	.DATA	3
K:	.DATA	?

b)

	LOAD	L
	SUBTRACT	M
	SUBTRACT	N
	STORE	K
	INCREMENT	K
DONE:	HALT	
L:	.DATA	?
M:	.DATA	?
N:	.DATA	?

c)

	LOAD	TEN
	COMPARE	K
	JUMPGT	PRINTK
	JUMP	DONE
PRINTK:	OUT	K
DONE:	HALT	
TEN:	.DATA	10
K:	.DATA	?

d)

	LOAD	L
	COMPARE	K
	JUMPGT	PRINTK
	OUT	L
	INCREMENT	L
	JUMP	DONE
PRINTK:	OUT	K
	INCREMENT	K
DONE:	HALT	
K:	.DATA	?
L:	.DATA	?

e)

	LOAD	ONE
	STORE	K
	LOAD	HUNDRED
COMP:	COMPARE	K
	JUMPGT	DONE:
	OUT	K
	INCREMENT	K
	JUMP	COMP
DONE:	HALT	
HUNDRED:	.DATA	100

ONE:	.DATA	1
K:	.DATA	?

12. Modify the program in Figure 6.8 so that it separately computes and prints the sum of all positive numbers and all negative numbers and stops when it sees the value 0.

	.BEGIN	
	CLEAR	SUM
	IN	N
AGAIN:	LOAD	ZERO
	COMPARE	N
	JUMPLT	NEG
	JUMPGT	POS
	JUMPEQ	DONE
NEG:	LOAD	NEGSUM
	ADD	N
	STORE	NEGSUM
	IN	N
	JUMP	AGAIN
POS:	LOAD	POSSUM
	ADD	N
	STORE	POSSUM
	IN	N
	JUMP	AGAIN
DONE:	OUT	POSSUM
	OUT	NEGSUM
	HALT	
POSSUM:	.DATA	0
NEGSUM:	.DATA	0
N:	.DATA	0
ZERO:	.DATA	0
	.END	

15. What value is entered in the symbol table for the symbols AGAIN, ANS, X, and ONE in the following program? (Assume that the program is loaded beginning with memory location 0.)

AGAIN: 2
ANS: 7
X: 8
ONE: 9

<<Some student may start at 3 – only deduct only a little for this offense>>

16. Look at the assembly language program in Figure 6.8. Determine the physical memory address associated with every label in the symbol table. (Assume that the program is loaded beginning with memory location 0.)

AGAIN: 2

NEG: 10

SUM: 12

N: 13

ZERO: 14