Chapter 1 Solutions

1	**Write a sequence of instructions for SIC to ALPHA equal to the product of BETA and GAMMA. Assume that ALPHA, BETA and GAMMA are defined as in Fig.1.3(a)** Answer: LDA BETA MUL GAMMA STA ALPHA : : ALPHA RESW 1 BETA RESW 1 GAMMA RESW 1
2	**Write a sequence of instructions for SIC/XE to set ALPHA equal to 4 * BETA – 9. Assume that ALPHA and BETA are defined as in Fig. 1.3(b). Use immediate addressing for the constants** LDA BETA LDS #4 MULR S,A SUB #9 STA ALPHA : : ALPHA RESW 1
3	**Write SIC instructions to swap the values of ALPHA and BETA.** LDA ALPHA STA GAMMA LDA BETA STA ALPHA LDA GAMMA STA BETA : : ALPHA RESW 1 BETA RESW 1 GAMMA RESW 1
4	**Write a sequence of instructions for SIC to set ALPHA equal to the integer portion of BETA ÷ GAMMA. Assume that ALPHA and BETA are defined as in Fig.1.3(a).** LDA BETA DIV GAMMA STA ALPHA : : ALPHA RESW 1 BETA RESW 1 GAMMA RESW 1
5	**Write a sequence of instructions for SIC/XE to divide BETA by GAMMA, setting ALPHA to the integer portion of the quotient and DELTA to the remainder. Use register-to-register instructions to make the calculation as efficient as possible.**

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	LDA BETA
	LDS GAMMA
	DIVR S, A
	STA ALPHA
	MULR S, A
	LDS BETA
	SUBR A, S
	STS DELTA
	:
	:
	ALPHA RESW 1
	BETA RESW 1
	GAMMA RESW 1
	DELTA RESW 1

6	**Write a sequence of instructions for SIC/XE to divide BETA by GAMMA, setting ALPHA to the value of the quotient, rounded to the nearest integer. Use register-to-register instructions to make the calculation as efficient as possible.** LDF BETA DIVF GAMMA FIX STA ALPHA : : ALPHA RESW 1 BETA RESW 1 GAMMA RESW 1
7	**Write a sequence of instructions for SIC to clear a 20-byte string to all blanks.** LDF BETA DIVF GAMMA FIX STA ALPHA : : ALPHA RESW 1 BETA RESW 1 GAMMA RESW 1
8	**Write a sequence of instructions for SIC/XE to clear a 20-byte string to all blanks. Use immediate addressing and register-to-register instructions to make the process as efficient as possible.** LDT #20 LDX #0 LOOP LDCH #0 STCH STR1,X TIXR T JLT LOOP : : STR1 RESW 20

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9	**Suppose that ALPHA is an array of 100 words, as defined in Fig. 1.5(a). Write a sequence of instructions for SIC to set all 100 elements of the array to 0.** LDA ZERO STA INDEX LOOP LDX INDEX LDA ZERO STA ALPHA, X LDA INDEX ADD THREE STA INDEX COMP K300 TIX TWENTY JLT LOOP : : INDEX RESW 1 ALPHA RESW 100 : ZERO WORD 0 K300 WORD 100 THREE WORD 3

10	**Suppose that ALPHA is an array of 100 words. Write a sequence of instruction for SIC/XE to arrange the 100 words in ascending order and store result in an array BETA of 100 elements.**
	
	LDS #3
	LDT #300
	LDX #0
	ADDLOOP
	LDA ALPHA, X
	MUL #4
	ADD BETA, X
	STA GAMMA, X
	ADDR S, X
	COMPR X, T
	JLT ADDLOOP
	:
	:
	ALPHA RESW 100
	BETA RESW 100
	GAMMA RESW 100

11	**Suppose that RECORD contains a 100-byte record, as in Fig. 1.7(a). Write a subroutine for SIC that will write this record on to device 05.** JSUB WRREC : : WRREC LDX ZERO WLOOP TD OUTPUT JEQ WLOOP

	LDCH RECORD, X WD OUTPUT TIX LENGTH JLT WLOOP RSUB : : ZERO WORD 0 LENGTH WORD 1 OUTPUT BYTE X “05” RECORD RESB 100
12	**Write a subroutine for SIC that will read a record into a buffer, as in Fig.1.7(a). The record may be any length from 1 to 100 bytes. The end of record is marked with a “null” character (ASCII code 00). The subroutine should place the length of the record read into a variable named LENGTH.** JSUB RDREC : : RDREC LDX ZERO RLOOP TD INDEV JEQ RLOOP RD INDEV COMP NULL JEQ EXIT STCH BUFFER, X TIX K100 JLT RLOOP EXIT STX LENGTH RSUB : : ZERO WORD 0 NULL WORD 0 K100 WORD 1 INDEV BYTE X “F1” LENGTH RESW 1 BUFFER RESB 100
13	**Write a subroutine for SIC/XE that will read a record into a buffer, as in Fig.1.7(a). The record may be any length from 1 to 100 bytes. The end of record is marked with a “null” character (ASCII code 00). The subroutine should place the length of the record read into a variable named LENGTH. Use immediate addressing and register-to-register instructions to make the process as efficient as possible,** JSUB RDREC : : RDREC LDX #0 LDT #100 LDS #0

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	RLOOP TD INDEV JEQ RLOOP RD INDEV COMPR A, S JEQ EXIT STCH BUFFER, X TIXR T JLT RLOOP EXIR STX LENGTH RSUB : : INDEV BYTE X “F1‟ LENGTH RESW 1 BUFFER RESB 10