

BLG212E - MIDTERM EXAM SOLUTIONS

QUESTION 1) [15 points] All results are interpreted as 8-bit unsigned.

a)

Result:
Hex = \$BC
Bin = %1011 1100
Dec = 188
Status Flags:
O=1 N=1 C=1

b)

Result:
Hex = \$3F
Bin = %0011 1111
Dec = 63
Status Flags:
None

c)

Result:
Hex = \$8F
Bin = %1000 1111
Dec = 143
Status Flags:
N=1

QUESTION 2) [40 points]

2a) [20 points]

The chip with 4K locations (2^{12}) requires 12 address lines for location selection.

The address decoder requires 2 address lines.

Total minimum number of lines in the Address Bus is = $12 + 2 = 14$

Total address capacity = $2^{14} = 2^4 * 2^{10} = 16 \text{ KB}$

Total used amount of memory = $4 + 2 + 2 + 1 = 9 \text{ KB}$

A12 and A13 lines are used for decoder.

A11 line is used to distinguish between M2 and M3.

For M4, A10 and A11 lines will be zero always.

Smallest Addresses :

Chip	Cap	A13	A12	A11	A10	A9	A8	A7	A6	A5	A4	A3	A2	A1	A0	HEXADECIMAL
M1	4K	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0000
M2	2K	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1000
M3	2K	0	1	1	0	0	0	0	0	0	0	0	0	0	0	1800
M4	1K	1	0	0	0	0	0	0	0	0	0	0	0	0	0	2000

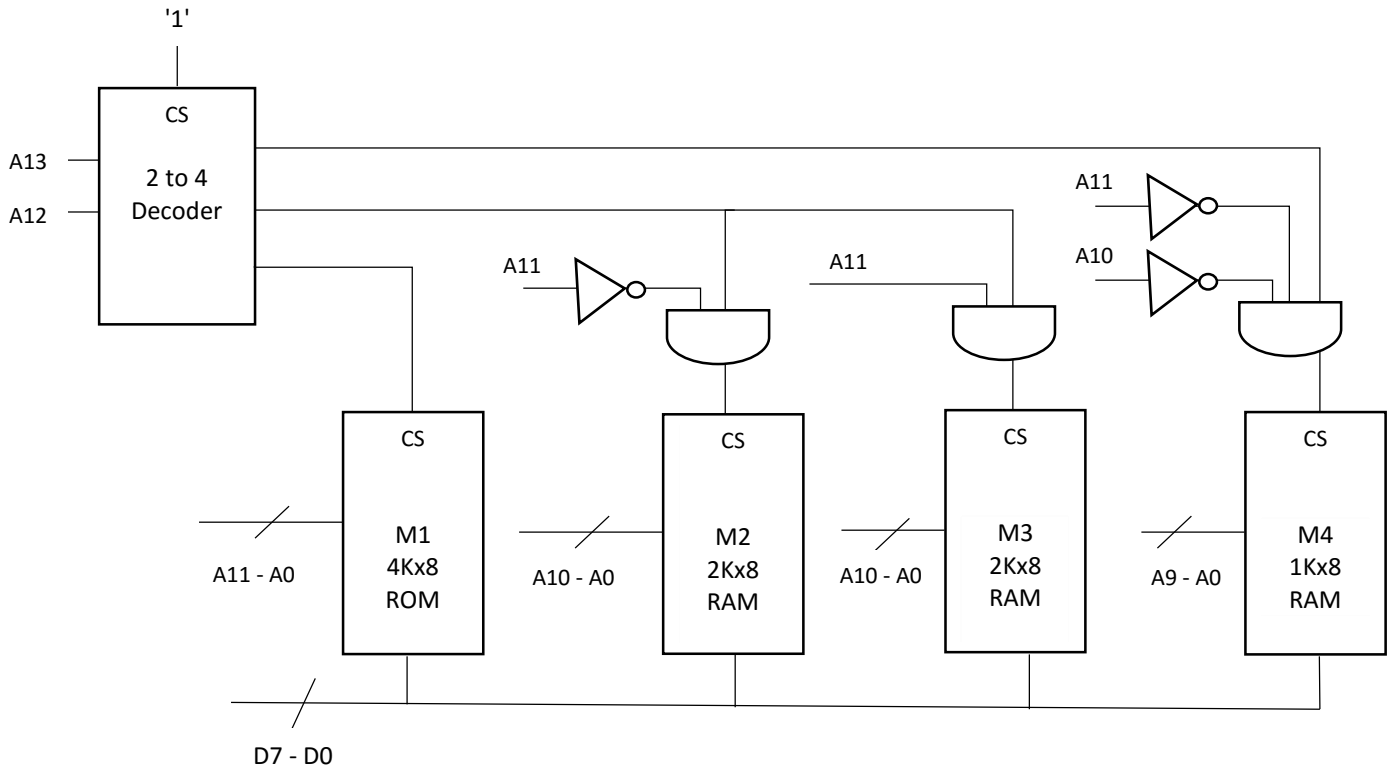
Biggest Addresses :

Chip	Cap	A13	A12	A11	A10	A9	A8	A7	A6	A5	A4	A3	A2	A1	A0	HEXADECIMAL
M1	4K	0	0	1	1	1	1	1	1	1	1	1	1	1	1	0FFF
M2	2K	0	1	0	1	1	1	1	1	1	1	1	1	1	1	17FF
M3	2K	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1FFF
M4	1K	1	0	0	0	1	1	1	1	1	1	1	1	1	1	23FF

Memory Map :

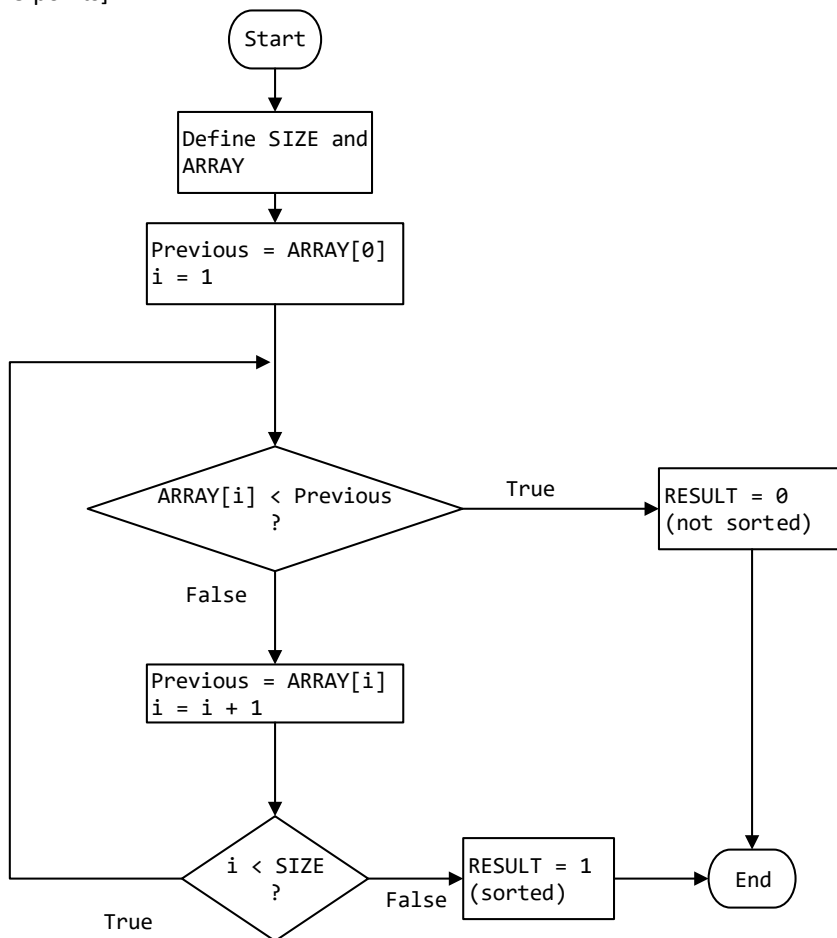
Chip Name	Memory Chip Type	Smallest Address	Biggest Address
M1	4 K x 8 bit ROM	0000	0FFF
M2	2 K x 8 bit RAM	1000	17FF
M3	2 K x 8 bit RAM	1800	1FFF
M4	1 K x 8 bit RAM	2000	23FF

2b) [20 points]



QUESTION 3) [45 points]

3a) [15 points]



3b) [30 points]

*Program determines whether an array is sorted or not (increasing order).

SIZE EQU 12

ARRAY RMB SIZE

ORG ARRAY

* DAT 1, 3, 4, 5, 7, 8, 8, 12, 10, 11, 15, 14 ;Not sorted sample

DAT 1, 3, 4, 5, 7, 8, 8, 9, 10, 11, 15, 16 ;Sorted sample

RESULT RMB 1 ; \$01 means array is sorted, \$00 means NOT sorted

START

LDA B, <ARRAY> ;Previous data (Get first element in ARRAY)

LDA SK, ARRAY+1 ;Adress of second element in ARRAY

DONGU

LDA A, <SK+0>;Get current data from ARRAY

CMP A, B ;Compare current data with previous data

BLT UNSORTED ;If A is less than B

MOV B, A ;Move Current data to Previous data

INC SK ;Increment loop counter

CMP SK, ARRAY+SIZE ;Compare to loop limit

BNE DONGU ;Go to loop

STA \$01, RESULT ;Array is sorted

INT ;Stop

UNSORTED

STA \$00, RESULT ;Array is NOT sorted

INT ;Stop