Faculty of Information Technology, University of Moratuwa

BSc. (Hons) in Information Technology

IN 2320 - Computer Architecture

B18 L2S2 - Assignment 3 (Take home)

184125T PERERA L.R.D

2/20/2021

Question 1

I. Memory width= 32 bits
Cache size=512KB=$2^9 * 2^{10} = 2^{19}$ B
Block size=4B*4=16=2^4B
Cache lines= Cache size/ Block size
$= 2^{19} / 2^4$
$= 2^{15}$

II. In Associative Mapping

28	4
Tag	word

III. In Direct Mapping

13	15	4
Tag	Cache	Word

IV. Cache Lines= 2^{15}
#of sets= $2^{15}/2^3$
$= 2^{12}$

V. In Set Associative Mapping

16	12	4
Tag	Set	Word

VI. 0x B1AC95F9

1	0	1	1	0	0	0	1	1	0	1	0	1	1	0	0	1	0	0	1	0	1	0	1	1	1	1	1	1	0	0	1

Set Number = 2399

Question 2

I. Stack based.

X =(A*B-C) + (A/C)

```
PUSH A
PUSH B
MUL
PUSH C
SUB
PUSH A
PUSH C
DIV
ADD
POP X
```

II. Accumulator based.

X=(A*B-C) +(A/C)

```
LOAD A
DIV C
STORE Y
LOAD A
MUL B
SUB C
ADD Y
STORE X
```

III. Memory- memory based.

X= (A*B-C) +(A/C)

```
DIV Y, A, C
MUL P, A, B
SUB P, P, C
ADD X, P, Y
```

IV. Register- Register based.

X=(A*B-C) +(A/C)

```
LOAD R1, A
LOAD R2, B
LOAD R3, C
DIV R4, A, C
MUL R5, A, B
SUB R6, R5, R3
ADD X, R6, R4
```

Question 3

-6*9

The binary value of 9→ 01001

The binary value of (-6)→ 00110 (6)

2's complement operation

11001+1

11010

A	**A**	**Q**	**Q_{-1}**	**M**
	00000	01001	0	11010
	00110	01001	0	11010
Circle 1	00011	00100	1	11010
	11101	00100	1	11010
Circle 2	11110	10010	0	11010
Circle 3	11111	01001	0	11010
	00101	01001	1	11010
Circle 4	00010	10100	1	11010
	11100	10100	1	11010
Circle 5	11110	01010	0	11010

Answer: 1111001010

Converting to the decimal →2's complement

0000110101+1

0000110110

54

Question 4

[MAR] ← [PC] Transfer the address from the PC to MAR.

[MBR] ← [MBR] Read the memory into the MBR.

[IR]←[MDR] Copy the instruction from the MBR to the instruction register.

[PC] ← [PC]+1 Program counter is incremented.

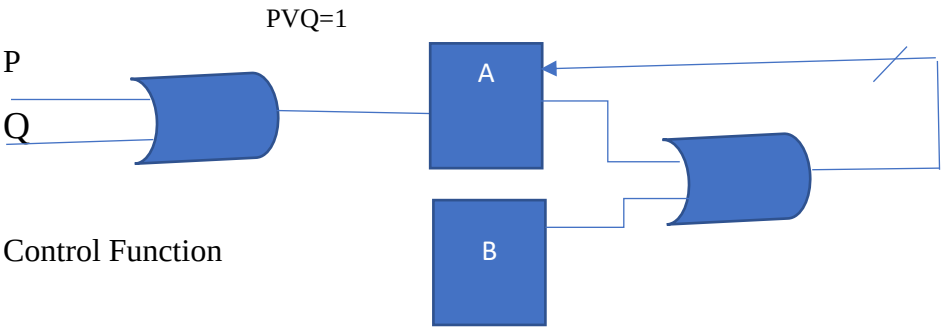
[MAR]← IR (operand) Decode, then execute.

[MBR]← [MAR] Reading the memory.

AC← MBR Transfer to the Accumulator.

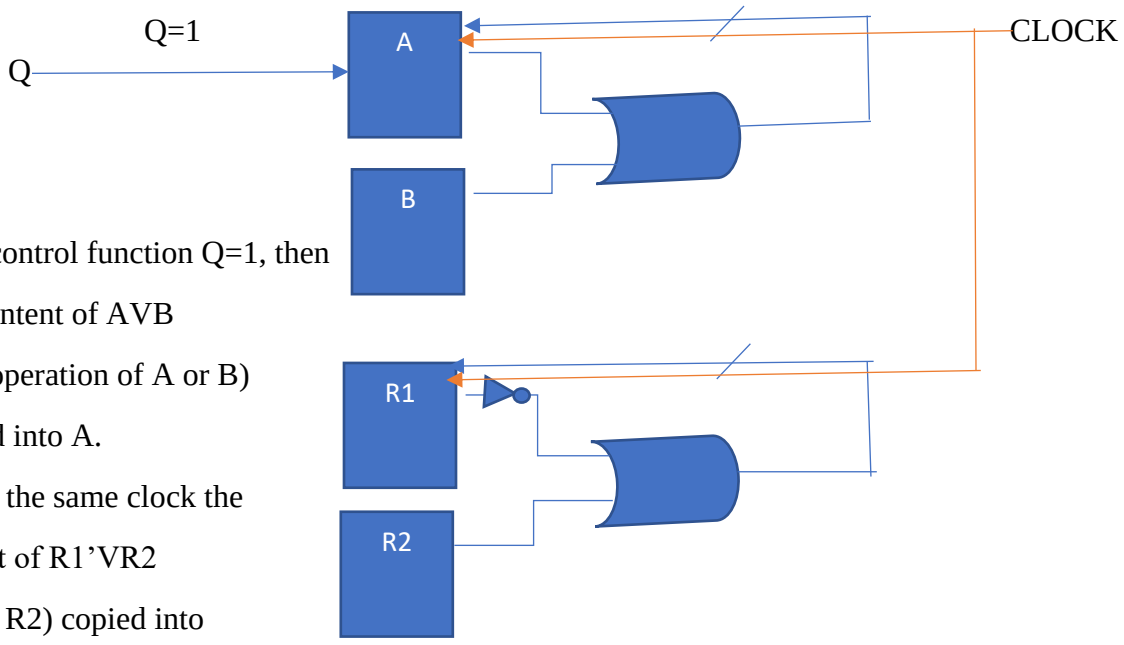
Question 5

1. P + Q: A←A+B



If Control function PVQ=1(Por Q), The content of AVB (the operation A or B) Copied into A.

2. Q: A←A+B, R1←R1'+R2



If the control function Q=1, then
The content of AVB
(The operation of A or B)
copied into A.
And at the same clock the
content of R1'VR2
(R1'or R2) copied into
R1.