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COA - Assignment - 1

1) 0x(00041440)

R-format

2) sw $t1, 4($t0)
43 9 8

101011 01000 01001 0000 0000 0000 0100

0x(AD09 0004)

3) $S2 = 0x(ABCD6789)

a) 0x(BCD67890)

b) 0x(00ABCD67)

4)

a) $t2 = 0001 0001 0010 0010 0011 0100 1000 0001

0100 0100 0110 1001 0000 0010 0000 0000

4 4 6 9 0 2 0 0

$t0 = 0x(44690200)

b) 131 = 10000011

$t0 = (44690283)16

c) $t1 = 0x(00123229)

$t2 = 0x(1122 3481)

$s0 = 0x(00023001)

d) $t3 = 0x(4467 9810)

$s6 = 0x(0002 3001)

$s0 = 0x(4465 A811)

e) $t0 = 0x(BB9A77EF)

f) $t0 = 0x(017734EF)

0	0000
1	0001
2	0010
3	0011
4	0100
5	0101
6	0110
7	0111
8	1000
9	1001

5) Moore's Law

no. of transistors on a microchip doubles every 2 years.

6) i) Simplicity favour Regularity
   a) fixed sized instructions
   b) Small no. of instruction formats
   c) opcode is always the first 6 bits.
   d) Simplicity reduces to perform as good as if is a high level language.

   ii) Smaller is faster
   a) Limited instruction set.
   b) Limited no of registers in register file.
   c) Limited no. of addressing mode

   iii) Make common case fast.
   a) Allow instruction to contain immediate operands
   b) Arithmetic operands from registers only

   iv) Good design demands good compromises
   a) All MIPS instructions are of same size, ie, same instruction length
   b) 32 bits long
   c) this has forced the designs to provide 3 different formats, R, I, & J types to meet the requirements.

7) lb → transfers one byte of data from main memory to register.
   sb → transfers lowest byte of data from register to main memory.

8)

8) a) R format

opcode	rs	rt	rd	sa	funct
6 bits	5 bits	5 bits	5 bits	5 bits	6 bits

⇒ sll, add

I format

opode	rs	rt	immidiate
(6 bits)	(5 bits)	(5 bits)	(16 bits)

⇒ lw, beq, andi, sw

J format

opcode	Jump
6 bits	26 bits

⇒ j

b)

```
loop: sll $t1, $s2, 2
      add $t1, $t1, $s3
      lw $t0, 0($t2)
      beq $t1, $t0, finish
      andi $s2, $s2, 1
      j loop
finish: add $s4, $t0, $t0
      sw $s4, 0($t2)
```

2000	0x(0012 4880)
2004	0x(0133 4820)
2008	0x(8D48 6000)
200c	0x(1928 0002)
2010	0x(2252 0001)
2020	0x(0800 00F4)
2024	0x(0108 A020)
2028	0x(AD54 0000)