CS220

Assignment-7

[PDS1]-

Alternate Name	Register Name	Use
$ra	$0	To store the return address
$t0-$t9	$1-$10	To Store temporary values
$s0-$s8	$11-$19	Saved Values
$a0-$a3	$20-$23	For the four parameters
$v0-$v1	$24-$25	For return values
$sp	$30	Stack pointer
$at	$29	Reserved for the assembler
$zero	$31	To store the constant value zero
$gp	$28	Global pointer
$k0-$k1	$26-$27	Reserved by the operating system

[PDS2] -

Size of instruction- 32 bits.
Size of register address- 5 bits
Number of Registers -32
Space in data memory - 32 spaces for 32 bits
Space in instruction memory - 32 spaces for 32 bits

[PDS3] -

- R-type instruction- 32 bits

Opcode [6 bits]	Address for source Register 1 [5 bits]	Address for source Register 2 [5 bits]	Address for destination Register [5 bits]	Shift amount [5 bits]	Function [6 bits]

- I-type instruction -32 bits

Opcode [6 bits]	Address for source Register 1 [5 bits]	Address for destination Register [5 bits]	Immediate Value [16 bits]

- J-type instruction -32 bits

Opcode [6 bits]	Target [26 bits]

INSTRUCTIONS

OPCODE[6 bits]	OPERATION
000001	add
000010	sub
000011	add unsigned
000100	sub unsigned
000101	and
000110	or
000111	sll
001000	srl
001001	slt
001010	addi
001011	subi
001100	andi
001101	ori
001110	lw
001111	sw
010000	beq
010001	bne
010010	bgt
010011	bgte
010100	ble
010101	bleq
010110	slti

010111	j
011000	jr
011001	jal

Working of Code

Data memory holds -

- mem[1]- contains the value n, number of numbers in the array.
- Mem[2]- Start of the array and subsequent space holds the following array elements.
- After sorting, the elements are all stored in the data memory.

The file v.v is the file with top module that contains the code for Control Unit, Data memory, Instruction Memory, Register File, Deciphering instructions and the Test bench.

Further sub-modules are ALU and further there are 32-bit adder, subtractor, logical and, or, etc.