

26. Write an example for immediate operand.

The quick add instruction with one constant operand is called add immediate or addi. To add 4 to register \$s3, we just write addi \$s3,\$s3,4 # \$s3 = \$s3 + 4

27. Which metric is the right one for comparing processors: energy or power?

Power is energy per unit time. **1 watt = 1 joule per second.** Energy is a better metric because it is tied to a specific task and the time required for that task. Power consumption will be a useful measure if the workload is fixed.

PART-B

1. Explain in detail about the eight ideas of computer architecture.
2. Explain in detail the different Instruction types. Compare their merits and demerits.
3. Explain the different types of Addressing modes with suitable examples.
4. Explain the various components of computer System with neat diagram.
5. Explain various performance measures of a computer.
6. Explain operations and operands of computer Hardware in detail
7. i) Discuss the Logical operations and control operations of computer
ii) Write short notes on Power wall
8. Explain in detail about the instructions for control operation.
9. Briefly discuss about Uniprocessor and Multiprocessor.
10. Explain Branching operations with example

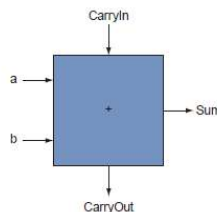
UNIT-II

Arithmetic Operations

PART-A

1. Define Full Adder (FA) with logic diagram

A full adder adds binary numbers and accounts for values carried in as well as out. A one-bit full adder adds three one-bit numbers, often written as *A*, *B*, and *C_{in}*; *A* and *B* are the operands, and *C_{in}* is a bit carried in (in theory from a past addition). The full-adder is usually a component in a cascade of adders, which add 8, 16, 32, etc.



2. What is arithmetic overflow.

In a computer, the condition that occurs when a calculation produces a result that is greater in magnitude than which a given register or storage location can store or represent. In a computer, the amount by which a calculated value is greater in magnitude than that which a given register or storage location can store or represent.

3. What are the floating point instructions in MIPS?

MIPS supports the IEEE 754 single precision and double precision formats with these instructions:

1. Floating-point addition
2. Floating-point subtraction
3. Floating-point multiplication
4. Floating-point division
5. Floating-point comparison
6. Floating-point branch

4. Define Integer Division and give its rule.

Integers are the set of whole numbers and their opposites. The sign of an integer is positive if the number is greater than zero, and the sign is negative if the number is less than zero. The set of all integers represented by the set {... -4, -3, -2, -1, 0, 1, 2, 3, 4...} Negative integers: {... -4, -3, -2, -1} Positive integers: {1, 2, 3, 4 ...} {0} is neither positive nor negative, neutral

Division Rule: The quotient of two integers with same sign is positive. The quotient of two integers with opposite signs is negative.

5. Write Restoring and Non-Restoring division algorithm

Restoring Division Algorithm:

1. Shift A and Q left one binary position.
2. Subtract M from A, and place the answer back in A.
3. If the sign of A is 1, set q₀ to 0 and add M back to A (that is, restore A); otherwise, set q₀ to 1.

Non-Restoring Division Algorithm

1. Do the following n times: If the sign of A is 0, shift A and Q left one bit position and subtract M from A; otherwise, shift A and Q left and add M to A. Now, if the sign of A is 0, set q₀ to 1; otherwise, set q₀ to 0.
2. If the Sign of A is 1, add M to A.

6. Write the rules for multiply operation on floating point numbers.

1. Add the exponents and subtract 127.
2. Multiply the mantissa and determine the sign of the result.

3. Normalize the resulting value, if necessary.
The rules for divide operation on floating point numbers:
 1. Subtract the exponents and subtract 127.
 2. Divide the mantissa and determine the sign of the result.
 3. Normalize the resulting value, if necessary.

7. Define Moore’s Law

Moore’s law has provided so much more in resources that hardware designers can now build much faster multiplication and division hardware. Whether the multiplicand is to added or not is known at the beginning of the multiplication by looking at each of the 32 multiplier bits.

8. What is Subword Parallelism?

Subword parallelism is a technique that enables the full use of word-oriented data paths when dealing with lower precision data. It is a form of low-cost, small-scale SIMD parallelism.

9. What are the overflow condition for addition and subtraction

Operation	Operand A	Operand B	Indicating Overflow
A+B	≥ 0	≥ 0	< 0
A+B	< 0	< 0	≥ 0
A-B	≥ 0	< 0	< 0
A-B	< 0	≥ 0	≥ 0

10. What decimal number is represented by this single precision float?

31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	
1	1	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Answer:

The sign bit is 1, the exponent field contains 129, and the fraction field contains $1 \times 2^{-2} = 1/4$, or 0.25. Using the basic equation,
 $(-1)^S \times (1 + \text{Fraction}) \times 2^{(\text{Exponent} - \text{Bias})}$
 $= (-1)^1 \times (1 + 0.25) \times 2^{(129-127)}$
 $= -1 \times 1.25 \times 2^2$
 $= -1.25 \times 4$
 $= -5.0$

11. Define Guard and Round

Guard is the first of two extra bits kept on the right during intermediate calculations of floating point numbers. It is used to improve rounding accuracy.

Round is a method to make the intermediate floating-point result fit the floating-point format; the goal is typically to find the nearest number that can be represented in the format.

12. Define ULP

Units in the Last Place is defined as the number of bits in error in the least significant bits of the significant between the actual number and the number that can be represented.

13. What is meant by sticky bit?

Sticky bit is a bit used in rounding in addition to guard and round that is set whenever there are nonzero bits to the right of the round bit. This sticky bit allows the computer to see the difference between 0.50 ... 00 ten and ... 01 ten when rounding.

14. Write the IEEE 754 floating point standard.

The IEEE 754 standard floating point representation is almost always an approximation of the real number.

$$(-1)^S \times (1 + \text{Fraction}) \times 2^{(\text{Exponent} - \text{Bias})}$$

where Single Precision Bias = 127, Double Precision Bias = 1023.

15. What are the steps in the floating-point addition?

The steps in the floating-point addition are

1. Align the decimal point of the number that has the smaller exponent.
2. Addition of the significands
3. Normalize the sum.
4. Round the result

PART- B

1. Explain the Multiplication algorithm in detail with diagram and examples
2. Discuss in detail about division algorithm in detail with diagram and examples
3. Explain in detail about floating point addition with example
4. Explain in detail about floating point multiplication
5. Give the algorithm for multiplication of signed 2's complement numbers and illustrate with an example
6. Multiply the following pair of signed 2's complement numbers : A = 010111, B = 101100.
7. Add the numbers 0.510 and -0.437510 using binary Floating point Addition algorithm
8. Multiply 1.10 10 x 10¹⁰ and 9.200 x 10⁻⁵ using binary Floating point multiplication
9. Calculate the division of A and B A : 3.264 x 10³ B: 6.52 x 10²