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Section: 12

Course : CSE 340

Assignment: 2

Arr to the 0: N: 1

We need to multiply  $\$50$  and  $\$51$ .

mult  $\$50, \$51$

into  $\$52$

$\$52 \leftarrow$  lower 32 bit

add  $\$53, \$52, \$40$        $\$53 = \$52 + \$40$

Ans to the Q.N: 2

div \$s0, \$s2

quotient  $\rightarrow$  Lower 32 bit

mflo \$t0

add \$s2, \$t0, \$t1

(Ans)

Ans to the Q. No. 3

$$A \rightarrow \$50$$

$$B \rightarrow \$51$$

$$X \rightarrow \$52$$

Given equation:

$$X = (A[4] + B[2]) + (B[3] - 5X)$$

Now,

lwcl \$f0, 16(\$50)

cvl.w.b \$f2, \$f0

lw \$t1, 8(\$51)

add \$t2, \$f2, \$t1

// A[4]  $\rightarrow$  \$50

// lw(\$f0)  $\rightarrow$  \$f2

// B[2]  $\rightarrow$  \$t1

// A[4] + B[2]  $\rightarrow$  \$t2

lw \$t3, 12(\$s1)

//BC3 → \$t3

sll \$t4, \$s2, 2

// \$t4 → \$t4

add \$t4, \$t4, \$s2

// \$s2 → \$t4

sub \$t3, \$t3, \$t4

//BC3} - \$s2 → \$t3

add \$s2, \$t2, \$t3

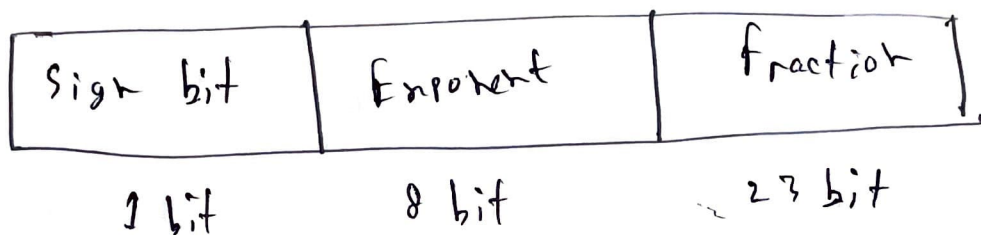
(A<sub>7</sub>)

Ans to the Q: N: 4

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(a)

Single Precision (32 bit)



biased exponent = 8 bits

$$\therefore \text{bias} = 2^{(8-1)} - 1$$
$$= 127$$

Given digit = -72.3456

$$(72)_{10} = (1001000)_2$$

$$(0.3456)_2 = (0101100001111001001110)_2$$

$$\therefore (72.3456)_{10} = (1001000.0101100001111001001110 \times 2^6)_2$$

$$\text{Normalized binary} = 1.0010000101100001111001001110 \times 2^6$$

Exponent -- 6

$$\therefore \text{Biased exponent} = 6 + 127 = 133$$

(b)

For a 18 bit register,

biased exponent bits = 6 bits

$$\therefore \text{bias} = 2^{6-1} - 1 \\ = 31$$

~~$\therefore$  bias~~ From a,

Exponent = 6

$$\therefore \text{biased exponent} = 6 + 31 \\ = 37 \quad (\text{Ans})$$

(c)

For 24 bit register,

biased exponent bit = 7 bits.

$$\therefore \text{bias} = 2^{7-1} - 1 \\ = 63$$

$$\therefore \text{biased exponent} = 6 + 63 = 69 \quad (\text{Ans})$$



Ans to the Q's

	Multiplicand	Multiplier	Product
	<del>000100</del> 0000 1000	0101	0000 0000
1	0001 0000	0010	0000 1000
2	0010 0000	0001	0000 1000
3	0100 0000	0000	0010 1000
4	1000 0000	0000	0010 1000

$$q. (1000)_2 = 8$$

$$(101)_2 = 5$$

$$(0010 1000)_2 = 40$$

$$\therefore \text{Product} = 0010 1000$$

(Ans)

Ans to the Q. No. 6

$$\text{Multiplicand } (0110)_2 = (6)_{10}$$

$$\text{Multiplier } (0110)_2 = (6)_{10}$$

LSB half bits of product = Multiplier

	Multiplicand	Product
	0110	0000 0110
1	0110	0000 0011
2	0110	0110 0011 0011 0001
3	0110	1001 0001 0100 1000
4	0110	0010 0100

$$\therefore \text{Product} = (0010 0100)_2 = (36)_{10}$$

Ans to Q. N. 2

$$X = (7ACD0000)_{16}$$

$$= (01111010110011010000000000000000)_{2}$$

$$= 0 \quad 111101 \quad 100110100000000000000000$$

sign

Exponent

fraction

$$\text{Biased exponent} = (11110101)_2$$

$$= (245)_{10}$$

$$\text{Bias} = 127 \quad [\because \text{single precision}]$$

$$\therefore \text{Exponent} = 245 - 127 \\ = 118$$

$$\text{fraction} = (0.100110100000000000000000)_2$$

∴ Normalize binary of

$$X = 1.100110100000000000000000 \times 2^{118}$$

$$\text{Again, } Y = (5BCA0000)_{16}$$

$$= (01011011100101000000000000000000)_2$$

$$= 0 \quad 1011011 \quad 100101000000000000000000$$

sign      Exponent

Fraction

Biased

$$\text{Exponent} = (1011011)_2$$

$$= (183)_{10}$$

$$\therefore \text{Exponent} = 183 - 127 \\ = 56$$

$$\therefore \text{Normalized } Y = 1.100101000000000000000000 \times 2^{56} \\ = 0.[61 \text{ 05} \dots]110010100000000000000000 \times 2^{118}$$

$$\therefore X+Y = 1.100110100000000000000000 \times 2^{118}$$

$$0.[61 \text{ 05} \dots]110010100000000000000000 \times 2^{118}$$

$$= 1.1001101[59 \text{ 05} \dots]110010100000000000000000 \times 2^{118}$$

(Ans)

Ans to Q: N: 8

$$X = (19.454)_{10}$$

$$= (10011.011010)_2$$

$$\text{Normalized } X = (1.0011011010)_2 \times 2^4$$

$$Y = (3.0124)_{10}$$

$$= (11.0000001100)_2$$

$$= 1.10000001100 \times 2^1$$

$$\therefore X * Y = (1.0011011010 * 1.10000001100) \times 2^5$$

$$= 1.110101001011001 \times 2^5$$

(Ans)

Ans to the Q. No. 9

$$X = (-9.435)_{10}$$

$$= (-1001.011011101)_2$$

$$= -1.001011011101 \times 2^3$$

$$Y = (15.129)_{10}$$

$$= (1111.6010000100)_2$$

$$= 1.1110010000100 \times 2^3$$

$$\therefore X * Y = -(1.001011011101 \times 1.1110010000100) \times 2^6$$

$$= -10.00111010111 \times 2^6$$

(Ans)

Ans to the Q: N: 10

Given value -  $(63.7813)_{10}$

$$= (1111111.110010000000000001)_2$$

$$= 1.1111111001000000000001 \times 2^5$$

(a)

For 21 bit register,

Exponent = 6 bits

$$\text{bias} = 2^{6-1} - 1$$

$$= 31$$

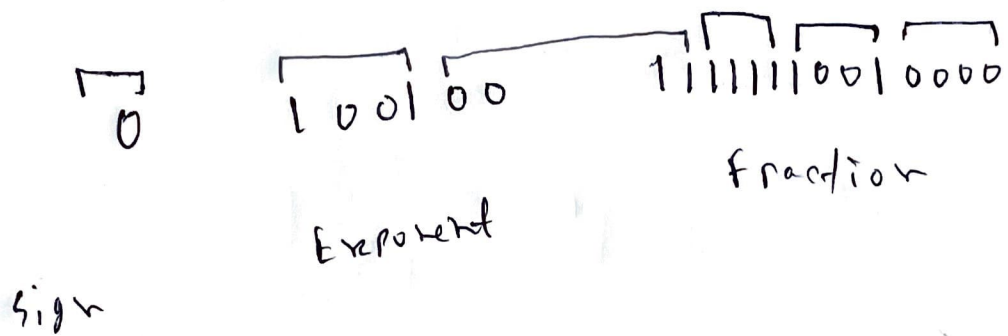
$$\begin{aligned} \therefore \text{Biased exponent} &= (5 + 31) \\ &= (36)_{10} \\ &= (100100)_2 \end{aligned}$$



sign bit = 0 [ 1 bit ]

fraction = 1111110010000 [ 14 bits ]

∴ floating point representation,



$$= (0x093f90)_{16}$$

(Ans)

(b)

for 12 bit register,

Exponent = 4 bit

$$\text{bias} = 2^{4-1} - 1 \\ = 7$$

$$\therefore \text{Biased exponent} = 7 + 5 \\ = (12)_{10} \\ = (1100)_2$$

sign bit = 0 [ 1 bits]

Fraction = 1111111 [ 7 bits]

$$\therefore \text{Floating point} = \overbrace{0}^{\text{sign}} \overbrace{1100}^{\text{Exponent}} \overbrace{1111111}^{\text{fraction}}$$

$$= (67f)_{16} \quad (\text{Ans})$$