Paper 2016.

QNo7 A :

cache memory = 16 K

4 - Blocks per set.

8 words in a block.

main memory = 2M words.

Main memory size = 2M words.

$2M = 2048\,KB = 2^{10} \cdot 2^{11} = 2^{21}$

$2^{s+w} = 2^{21} \Rightarrow s + w = 21.$

Cache memory size = 16 K.

$16Kb = 2^{10} \cdot 2^{4} = 2^{14}$

$2^{r+w} = 2^{14}.$

8-words in block $= 2^{w} = 2^{3}$.

2^{w} = No of words.

2^{s} = No of blocks in main memory.

2^{r} = No of lines in cache.

w = 3 - bits.

s = 18 - bits

r = 11 - bits

Memory Address.

Tag	set	word
↓	↓	↓
s-d	d	w

$$\text{No of sets} = \frac{\text{No of lines in cache.}}{\text{No of line/block per set.}}$$

$$\text{No of sets} = 2^d = \frac{2^{11}}{4} = \frac{2^{11}}{2^2} \Rightarrow 2^9 \Rightarrow 512.$$

512 sets will be in cache.

Tag	set	word
9	9	3

Q.1 multiplication algorithm for binary integers multiply 14_{10} by 21_{10}.

	64	32	16	8	4	2	1	
14 =	0	0	0	1	1	1	0	→ M
21 =	0	0	1	0	1	0	1	→ Q.

we will take 6 bits as n = 5 bits are taken in even numbers.

M = 001110

$14 \times 21 = 294$.

Q = 010101

-M = 110010

A	Q_0	Q_{-1}	OP	
000000	010101	0	initial	
110010	010101	0	A − M	1st
111001	001010	1	RS.	
000111	001010	1	A + M	2nd
000011	100101	0	RS.	
~~11~~0101	100101	0	A − M	3rd
1~~0~~1010	110010	1	RS	
001000	110010	1	A + M	4th
000100	011001	0	RS	
110110	011001	0	A − M	5th
111011	001100	1	RS	
001001	001100	1	A + M	6th
000100	100110	0	RS	

000100100110 = 294 Ans.

Q.2 multiply -3 by 2.

		8 4 2 1		
3	=	0 0 1 1		
-3	=	1 1 0 1	→	M
2	=	0 0 1 0	→	Q.

$-3 \times 2 = -6$

A	Q₀	Q-1	OP	
0000	0010	0	Initial	
0000	0001	0	RS	1st
0011	0001	0	A-M	2nd
0001	1000	1	RS	
1110	1000	1	A+M	3rd
1111	0100	0	RS	
1111	1010	0	RS	4th

128	64	32	16	8	4	2	1
1	1	1	1	1	0	1	0

$-128 + 64 + 32 + 16 + 8 + 2 = -6$

Ans.

Q.3 For 32 bit floating point number answer the following questions.

1 01001101 0001 0000 0000 0000 0000 0011 000

(i) True value of exponent.

128	64	32	16	8	4	2	1
0	1	0	0	1	1	0	1

$64 + 8 + 4 + 1 = 77 - 127 = -50$

(ii) what is significant value & its sign.

1. 0001 00000000 0000 0011000

sign is negative.

(iii) what decimal value is represented by above bit pattern.

$2^{-4} + 2^{-19} + 2^{-20} = 0.062503$.

1.062503 is represented

over all value :

-1.062503×2^{-50}

2016

Q.3(a) For 32 bit floating point number.

1 10001101 00011100 0000 0000 0000 0000

(i) +ve or −ve ; true value of exponent.

128	64	32	16	8	4	2	1
1	0	0	0	1	1	0	1

$128 + 8 + 4 + 1 = 141 - 127 = 14$

its positive exponent.

(ii) Significant value & its sign.

1.00011100 0000 0000 0000 000

sign is negative.

(iii) what decimal value is represented.

$2^{-4} + 2^{-5} + 2^{-6} = 0.109375.$

$-1.109375 \times 2^{14}.$

$(1.0001\ 1100\ 0000\ 0000\ 0000\ 0000\ 000)_2 \times 2^{14}$

$1000111000000000.000000000000$

$2^{14} + 2^{10} + 2^{9} + 2^{8} = -18176.00$ Ans.

2019.

Q 2 Extend 1001 expressed in 2s complement to 8bits.

1111 1001

Q 3 Extend 1111 expressed in sign magnitude to 8 bits.

1000 0111

Q.4 what true exponent value bit pattern 10110000 in bias exponent field refer to.

10110000 = 176.

176 - 127 = 49

e = 49.

Q.5 -46 will be represented in bias exponent field by bit pattern.

-46 + 127 = 81

e = 01010001

Q.6 what decimal integer value bit pattern 11101100 in 2's complement representation refer to.

128	64	32	16	8	4	2	1
1	1	1	0	1	1	0	0

$-128 + 64 + 32 + 8 + 4 + 1 = -20.$

Q.7 Negate 1111 0000 expressed in sign magnitude representation.

$-112 = 1\ 111\ 0000$

$+112 = 0\ 111\ 0000$

Q.1 Negate 01011101 expressed in 2's complement form.

128	64	32	16	8	4	2	1
0	1	0	1	1	1	0	1

$64 + 16 + 8 + 4 + 1 = 93.$

$-93 =$ 1 0 1 0 0 0 1 1 Ans.