CAT-II
CAO

110 111
001 001

(Q2)

Table for modified Booth's algorithm:

i+1	i	i-1	operation
0	0	0	0XM
0	0	1	+1XM
0	1	0	+1XM
0	1	1	+2XM
1	0	0	-2XM
1	0	1	-1XM
1	1	0	-1XM
1	1	1	0XM

110011
110100

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3.

CAT-II

CAO

Q2)

Booth (Modified)

M = 12 ⇒ 001100 ⇒ -M = 110100

Q = 7 ⇒ 000111 ⇒ +2M = 011000

comment	A	Q	Q-1	SC
initial	000000	000111	0	3
	110100			
Subtract M	110100	000111	0	
Ashr	111010	000011	1	2
Ashr	111101	000001	1	
	011000			
Add +2M	010101	000001	1	
Ashr	001010	100000	1	1
Ashr	000101	010000	0	
Add +0M				
Ashr	000010	101000	0	0
Ashr	000001	010100	0	

Answer ⇒ 1010100

decimal ⇒ 64x1 + 1x16 + 1x4

= 84 ans.

Q4) a)

Main memory = 8MB = $8 \times 2^{20} = 2^{23}$

cache memory = 16KB = $16 \times 2^{10} = 2^{14}$

Byte per blocks = 8 bytes = 2^3

∴ no. of blocks = $\frac{\text{cache memory}}{\text{Bytes per block}}$

$= \frac{2^{14}}{2^3} = 2^9 =$ **512 blocks**

$\Rightarrow 2^r = 512$

$\Rightarrow$ **r = 9**.

↳ we know $2^{s+w} = 2^{23}$ (as calculated)

$\rightarrow$ **s + w = 23**

Bytes per block = $2^3 \Rightarrow$ **w = 3**.

$\rightarrow$ s = 20

r = 9

s − r = 11

w = 3

∴ Memory address will look like:

s+w=23

s-r=11	r=9	w=3
tag	line	word

for direct mapping.

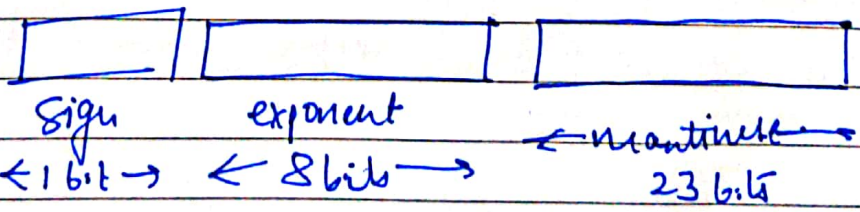
b) Table:

4	2	0	1	2	6	1	4	6	2
		0	1	1	1	1	1	x	2
	2	2	2	x	6	6	6	6	6
4	4	4	4	4	4	4	4	4	4
		1 hit		hit	hit	hit	hit		

page fault = 6

Q1) b) (i) Direct
(ii) Associative
(iii) Key-associative.
(iv) Set-associative.

Q3) 1.85 in IEEE 754



$1.85 = (-1)^{sign} \left(2^{component-127}\right) (1.mantissa)$

as 18.5 is +ve then sign → 0

$16 = 2^4 = 2^{\text{exponent}} = 127$

then exponent $= 127 + 4 = 131$

$(10000011)_2$

So $18.5 = 16 \times (1.M)$

$18.5 = 16 \times (1 + 0.M)$

$= 1.1563 = 1 + 0.M$

$= 0.M = 0.15625 = (001010\ldots)_2$

then :-

0	10000011	00101000000000000000000
0 (S)	$(131)_{10}$ (E)	$(0.15625)_{10}$ (M)

Q1) a) data word : 01010011011

$C_1 = 1$, $C_2 = 1$, $C_4 = 1$, $C_8 = 0$

Data bits = 01010110

calculating check bits :—

$C_1 = D_1 \oplus D_2 \oplus D_4 \oplus D_5 \oplus D_7$
$C_2 = D_1 \oplus D_3 \oplus D_4 \oplus D_6 \oplus D_7$
$C_4 = D_2 \oplus D_3 \oplus D_4 \oplus D_8$
$C_8 = D_5 \oplus D_6 \oplus D_7 \oplus D_8$

$C_1 = 0 \oplus 1 \oplus 0 \oplus 1 \oplus 1 = 1$
$C_2 = 0 \oplus 1 \oplus 0 \oplus 0 \oplus 1 = 0$
$C_4 = 1 \oplus 1 \oplus 0 \oplus 0 = 0$
$C_8 = 1 \oplus 0 \oplus 1 \oplus 0 = 0$.

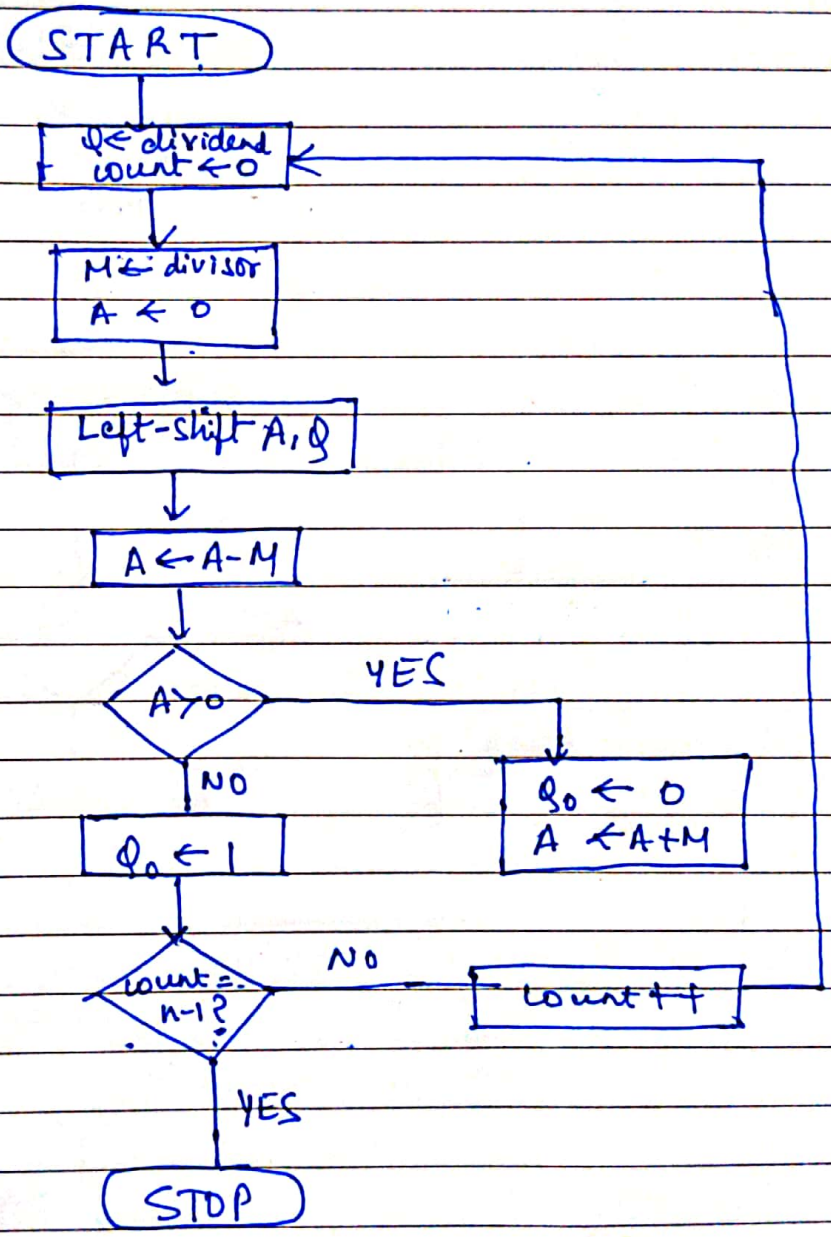
taking (XOR) of old & new check bits :

$1000 \oplus 1110 = (0110)_2 = (6)_{10}$

∴ we have error in 6th position which has D_2

Q3) b)

flowchart for restoring division algorithm :



n	M	A	Q	
7	0001000	0000000	100110	
		0000001	00110?	SLA Q
		1111001	00110?	A = A - M
		0000001	00111?00	Q[0] = 0
				Res A
6		0000010	01100?	
		1111010	01100?	SLAQ
		0000010	01110000	A = A - M
				Q[0] = 0
5		0000100	11000?	Res A
		1111100	11000?	← SLAQ
		0000100	11000000	A = A - M
				Q[0] = 0 Res A
4		0001001	11000?	SLAQ
		0000001	10000?	A = A - M
		0000000	10000?1	Q[0] = 1

Answer = 1001.11