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Date: __.__.____

Operating Systems

Digital Assignment 2

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Q.1. Find the page fault & hit ratio for the following string of reference numbers with frame size 3 and 5 Using FCFS, LRU, optimal. Compare the page fault of both the frame sets and depict which algorithm follows Belady's anomaly.

[3, 1, 2, 4, 2, 4, 1, 5, 9, 2, 1, 4, 7, 8, 3]

→ A] For frame size 3

i) FCFS

Request	3	1	2	4	2	4	1	5	9	2	1	4	7	8	3
Frame3			2	2	2	2	2	2	9	9	9	4	4	4	3
Frame2		1	1	1	1	1	X	5	5	5	1	1	1	8	8
Frame1	3	3	3	4	4	4	4	4	4	2	2	2	7	7	7
Miss/ Hit	M	M	M	M	H	H	H	M	M	M	M	M	M	M	M

Total Misses (page faults) = 12

Total Hits = 3

Hit ratio = $\frac{3}{15} = 0.2$

ii) LRU

Request	3	1	2	4	2	4	1	5	9	2	1	4	7	8	3
F3			2	2	2	2	2	5	5	5	1	1	1	8	8
F2		1	1	1	1	1	1	1	1	2	2	2	7	7	7
F1	3	3	3	4	4	4	4	4	9	9	9	4	4	4	3
Hit/ miss	M	M	M	M	H	H	H	M	M	M	M	M	M	M	M

Total page faults = 12
Total Hits = 3
Hit Ratio = $\frac{3}{15}$ = 0.2

iii) optimal

Request	3	1	2	4	2	4	1	5	9	2	1	4	7	8	3
F3			2	2	2	2	2	2	2	2	2	2	2	8	8
F2		1	1	1	1	1	1	1	1	1	1	1	7	7	7
F1	3	3	3	4	4	4	4	5	9	9	9	4	4	4	3
Hit/ miss	M	M	M	M	H	H	H	M	M	H	H	M	M	m	M

Total page faults = 10
Total Hits = 5
Hit Ratio = $\frac{5}{15}$ = 0.33

B) For frame size 5

i) FCFS

Request	3	1	2	4	2	4	1	5	9	2	1	4	7	8	3
F5								5	5	5	5	5	5	5	5
F4				4	4	4	4	4	4	4	4	4	4	8/4	3
F3			2	2	2	2	2	2	2	2	2	2	2/	8	8
F2		1	1	1	1	1	1	1	1	1	1	1/	7	7	7
F1	3	3	3	3	3	3	3	3/	9	9	9	9	9	9	9
Miss/ Hit	M	M	M	M	H	H	H	M	M	H	H	H	M	M	M

Total page faults = 9

Total hits = 6

Hit Ratio = $\frac{6}{15}$ = 0.4

ii) LRU

Request	3	1	2	4	2	4	1	5	9	2	1	4	7	8	3
F5								5	5	5	5	5/	7	7	7
F4				4	4	4	4	4	4	4	4	4	4	4	4
F3			2	2	2	2	2	2/3	2	2	2	2	2	2/	3
F2		1	1	1	1	1	1	1	1	1	1	1	1	1	1
F1	3	3	3	3	3	3	3	3/	9	9	9	9	9/	8	8
Miss/ hit	M	M	M	M	H	H	H	M	M	H	H	H	M	M	M

Total Page faults = 9

Total hits = 6

Hit ratio = $\frac{6}{15}$ = 0.4

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iii) optimal

Request	3	1	2	4	2	4	1	5	9	2	1	4	7	8	3
F5								5	9	9	9	9	9	9	9
F4				4	4	4	4	4	4	4	4	4	4	4	4
F3			2	2	2	2	2	2	2	2	2	2	7	8	8
F2		1	1	1	1	1	1	1	1	1	1	1	7	7	7
F1	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
miss/ Hit	M	M	M	M	H	H	H	M	M	H	H	H	M	M	H

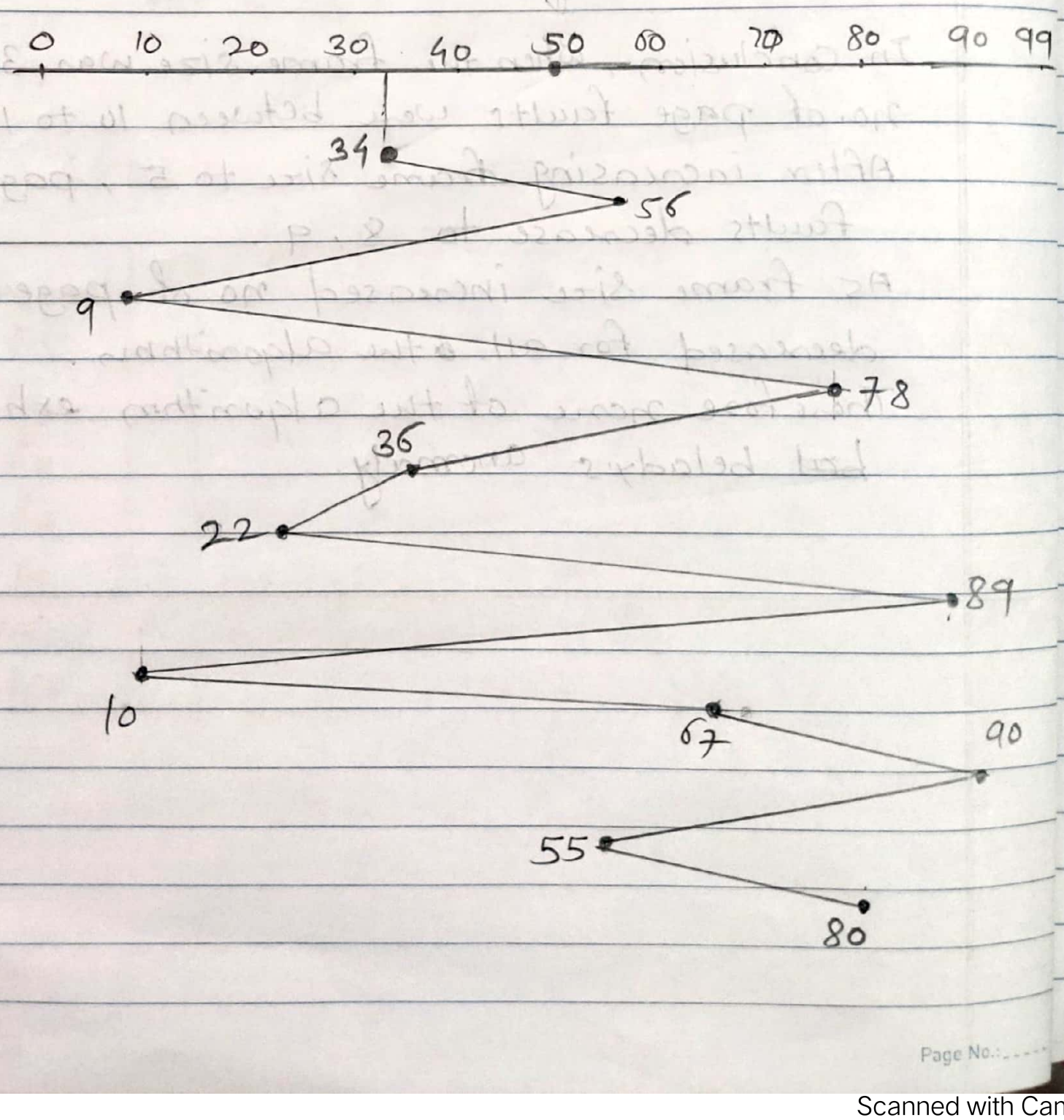
Total page faults = 8
Total hits = 7
Hit Ratio = $\frac{7}{15} = 0.467$

In conclusion, when the frame size was 3, no. of page faults were between 10 to 12. After increasing frame size to 5, page faults decrease to 8, 9.
As frame size increased no. of page faults decreased for all the algorithms.
Therefore none of the algorithm exhibits ~~bad~~ belady's anomaly.

Q.2. Draw the movement chart of the read write head while satisfying the needs of the disk accen if the request falls an 34, 56, 9, 78, 36, 22, 89, 10, 67, 90, 55 and 80 in a platter consists of 100 disketter (0-99). Compare the seek time of the following methods :-
FCFS, SSTF, SCAN, C-SCAN, Look, C-Look

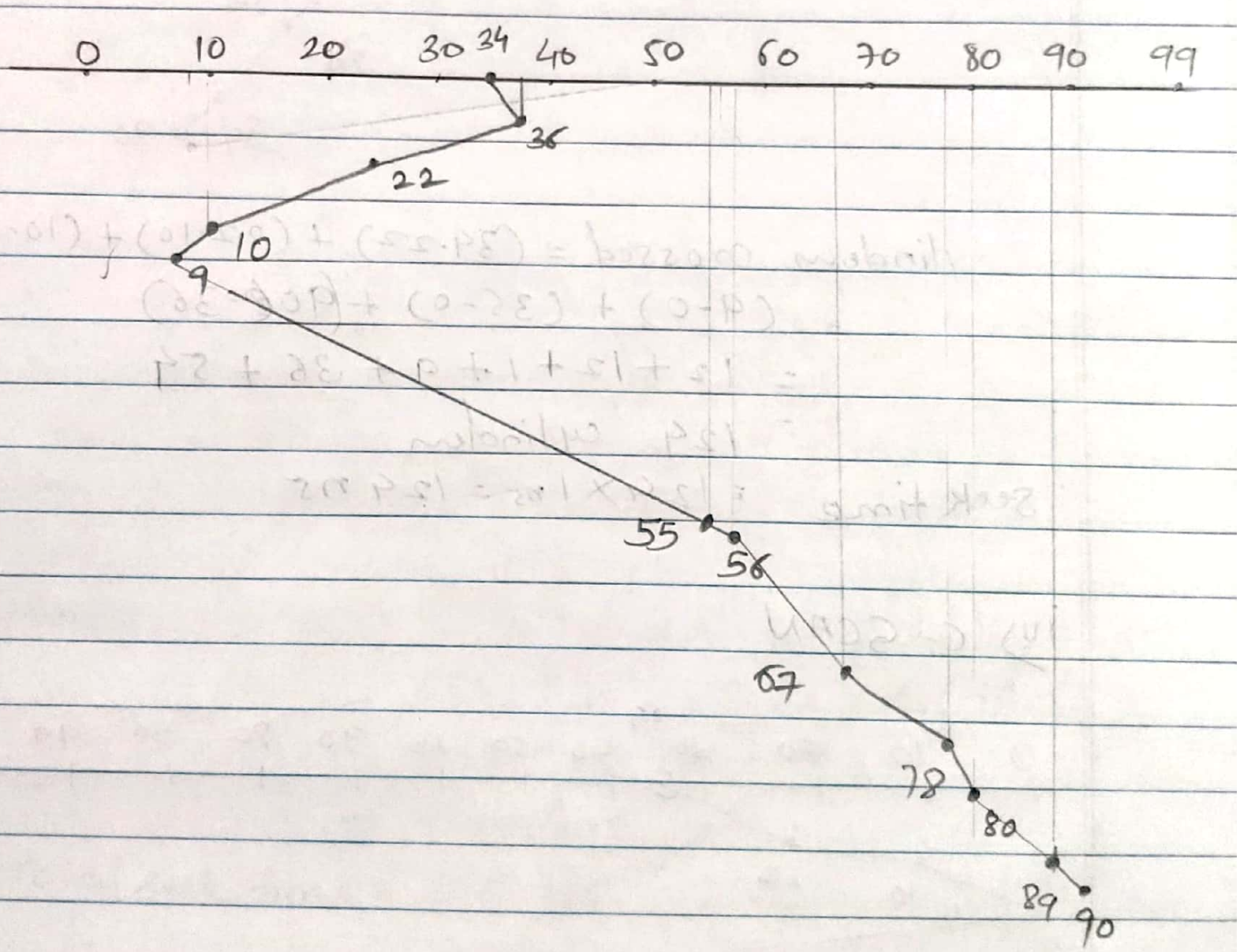
→ As the head pointer position is not mentioned in the question, lets assume it at ~~50~~ 34, and moving in ~~left~~ right direction.

(i) FCFS



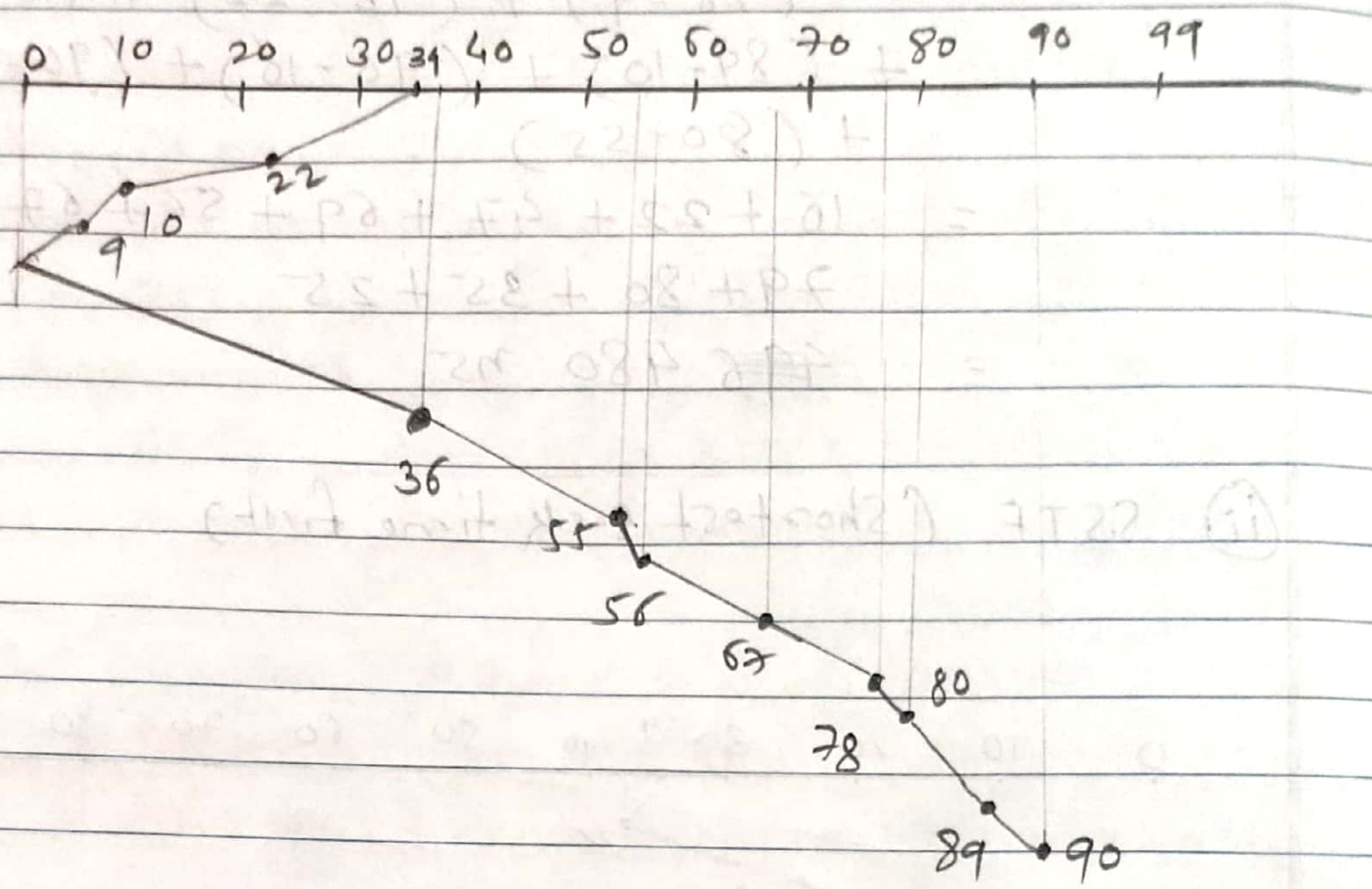
seek time = ~~(50-34)~~ + (55-34) + (56-9) +
(78-9) + (78-22) + (89-22)
+ (89-10) + (90-10) + (90-55)
+ (80-55)
= 16 + 22 + 47 + 69 + 56 + 67 +
79 + 80 + 35 + 25
= ~~496~~ 480 ms

(ii) SSTF (Shortest seek time first)



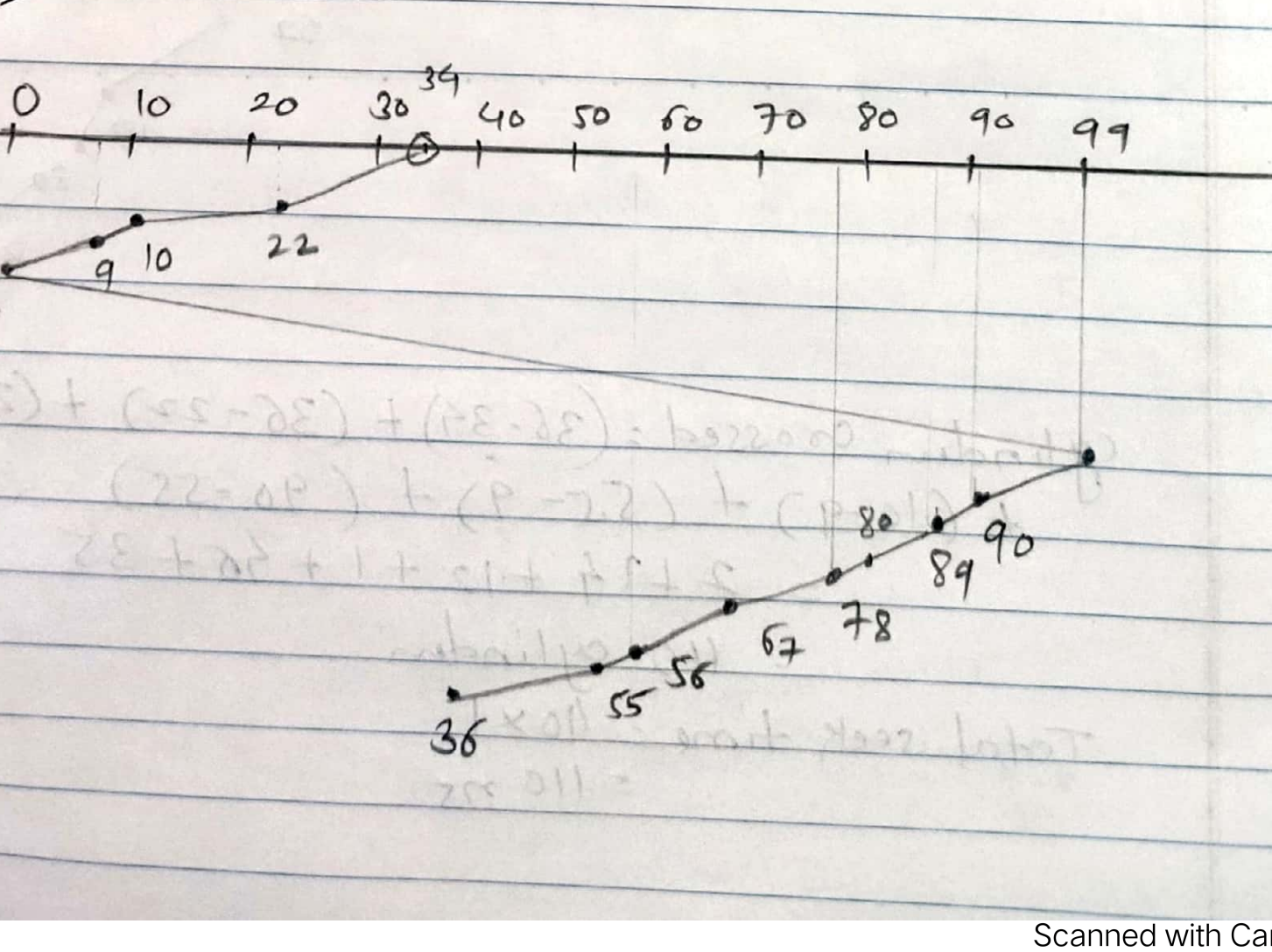
Cylinders crossed = (36-34) + (36-22) + (22-10)
+ (10-9) + (55-9) + (90-55)
= 2 + 14 + 12 + 1 + 46 + 35
= 110 cylinders
Total seek time = 110 × 1
= 110 ms

iii) SCAN



Cylinders crossed = (34-22) + (22-10) + (10-9) + (9-0) + (36-0) + (90-36)
= 12 + 12 + 1 + 9 + 36 + 54
= 124 cylinders
seek time = 124 × 1 ms = 124 ms

iv) C-SCAN



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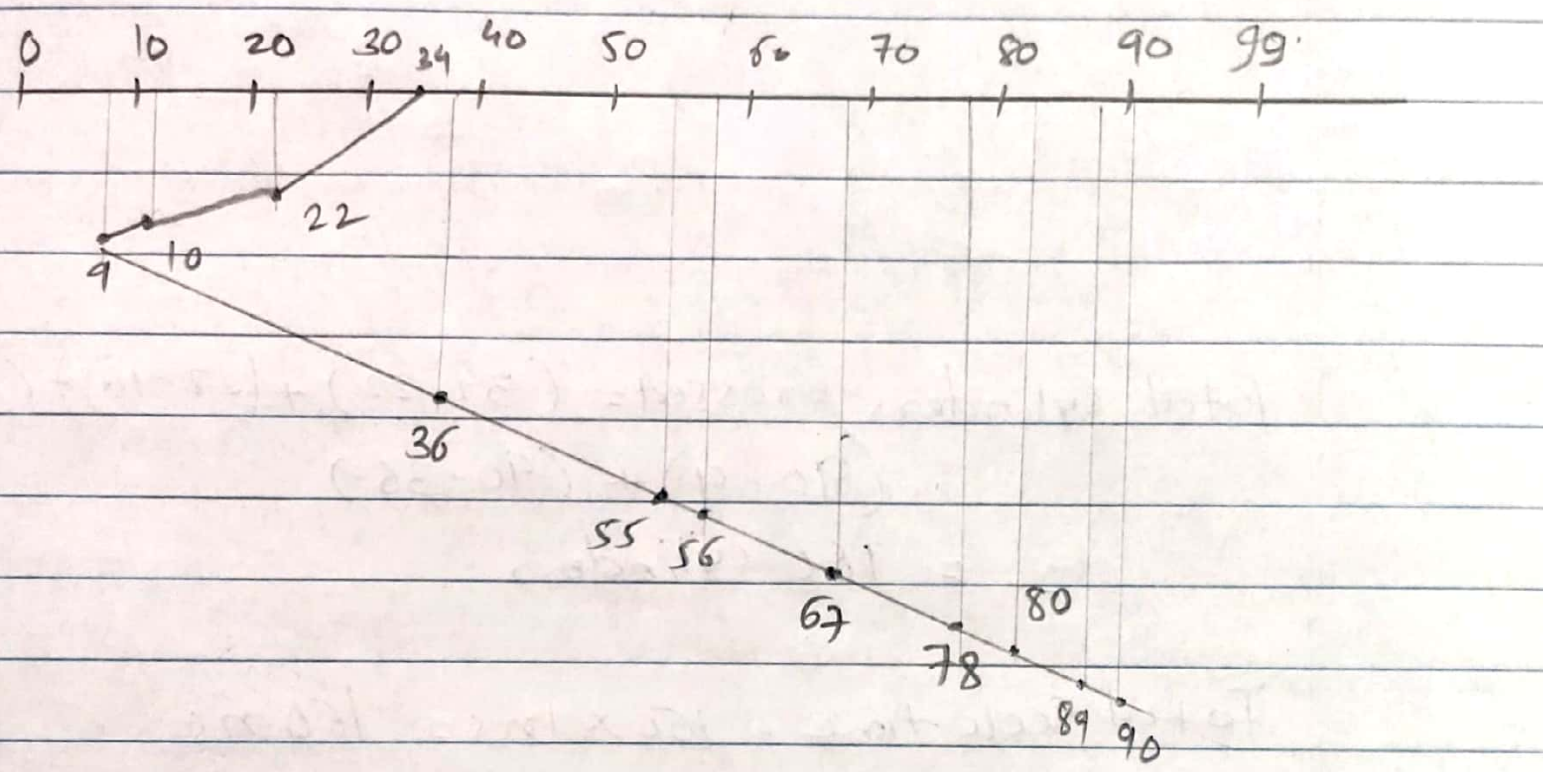
Cylinders crossed = (34-22) + (22-0) + (99-0) + (99-36)
= 12 + 22 + 99 + 63
= 196 cylinders

Total seek time = 196 × 1
= 196 ms

(iv) Look



Cylinders crossed = (34-22) + (22-10) + (10-9) + (36-9) + (55-36) + (90-55)
= 12 + 12 + 1 + 27 + 19 + 35
= 106 cylinders

Total seek time = 106 ms

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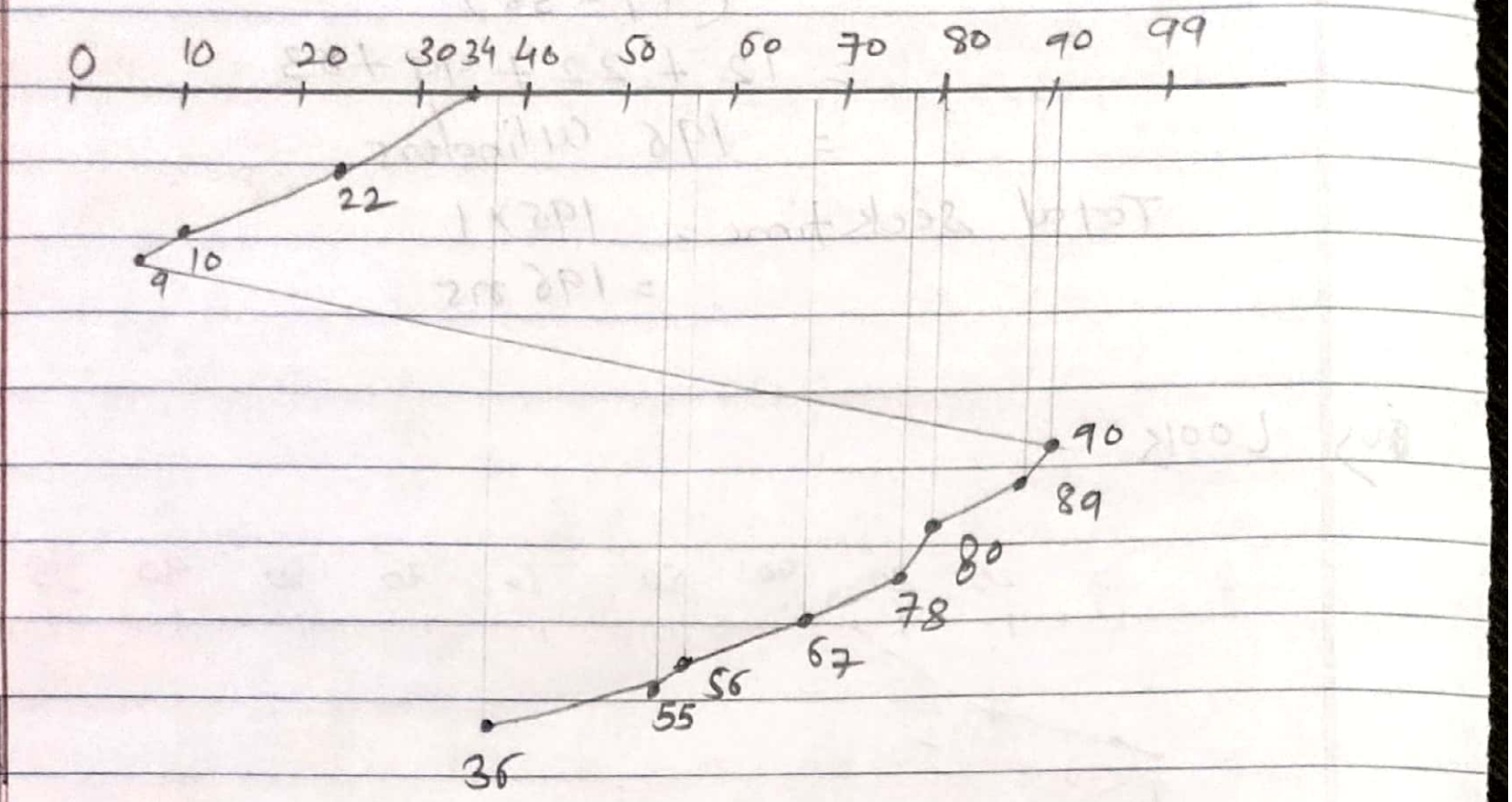
vi) C-Look



Total cylinders crossed = (34-22) + (22-10) + (10-9) + (90-9) + (90-36)
= 160 cylinders

Total Seek time = 160 × 1ns = 160 ns

FCFS took the highest time to satisfy all the requests which is 480 ns and Look had lowest seek time of 106 ns.
Seek time order is;
Look < SSTF < SCAN < C-Look < C-SCAN < FCFS