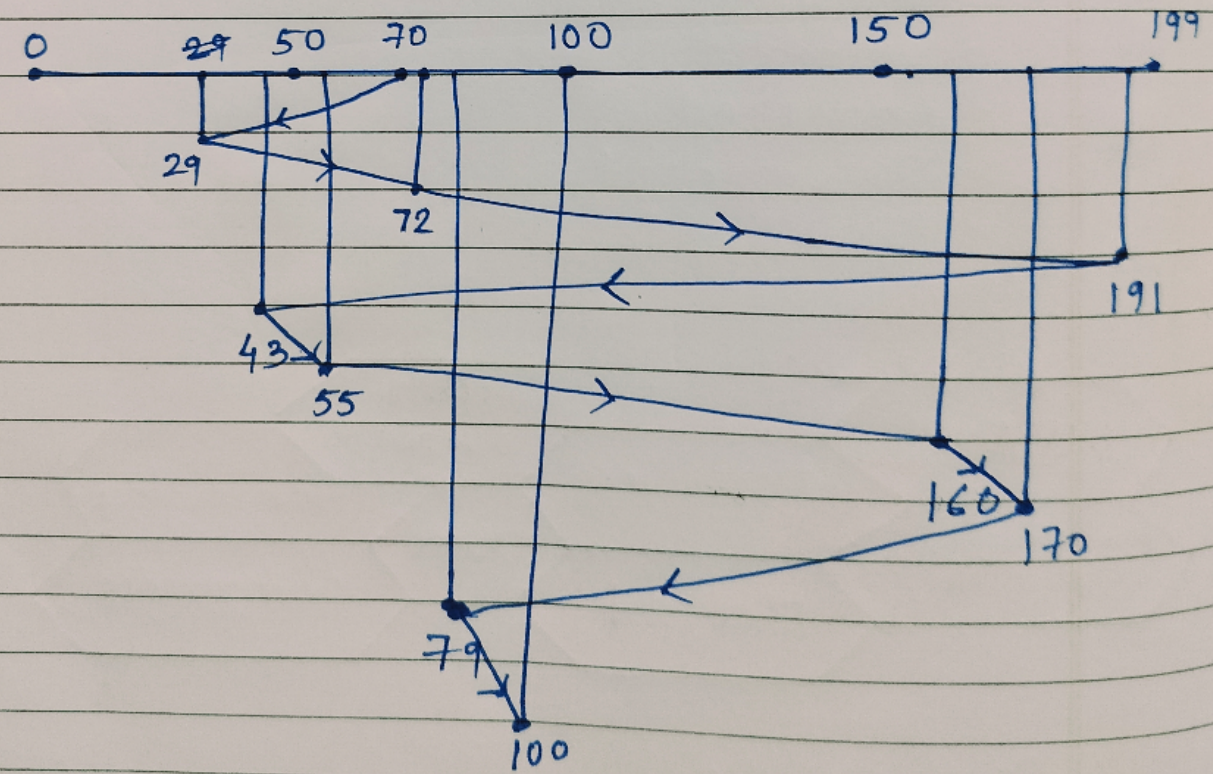
Disk Scheduling Algorithms

- Calculate seek time for following disks :
  29, 72, 191, 43, 55, 160, 170, 79, 100
  using (i) FCFS
  (ii) SSTF
  (iii) SCAN
  (iv) C-SCAN
  (v) LOOK
  (vi) C-LOOK
  } Consider head movement towards larger direction

Head = 70 , Size = 200

Sol FCFS



Seek Time = (70 - 29) + (72 - 29) + (191 - 29)
+ (191 - 43) + (55 - 43) + (160 - 55) +
(170 - 160) + (170 - 79) + (100 - 79)

= 633

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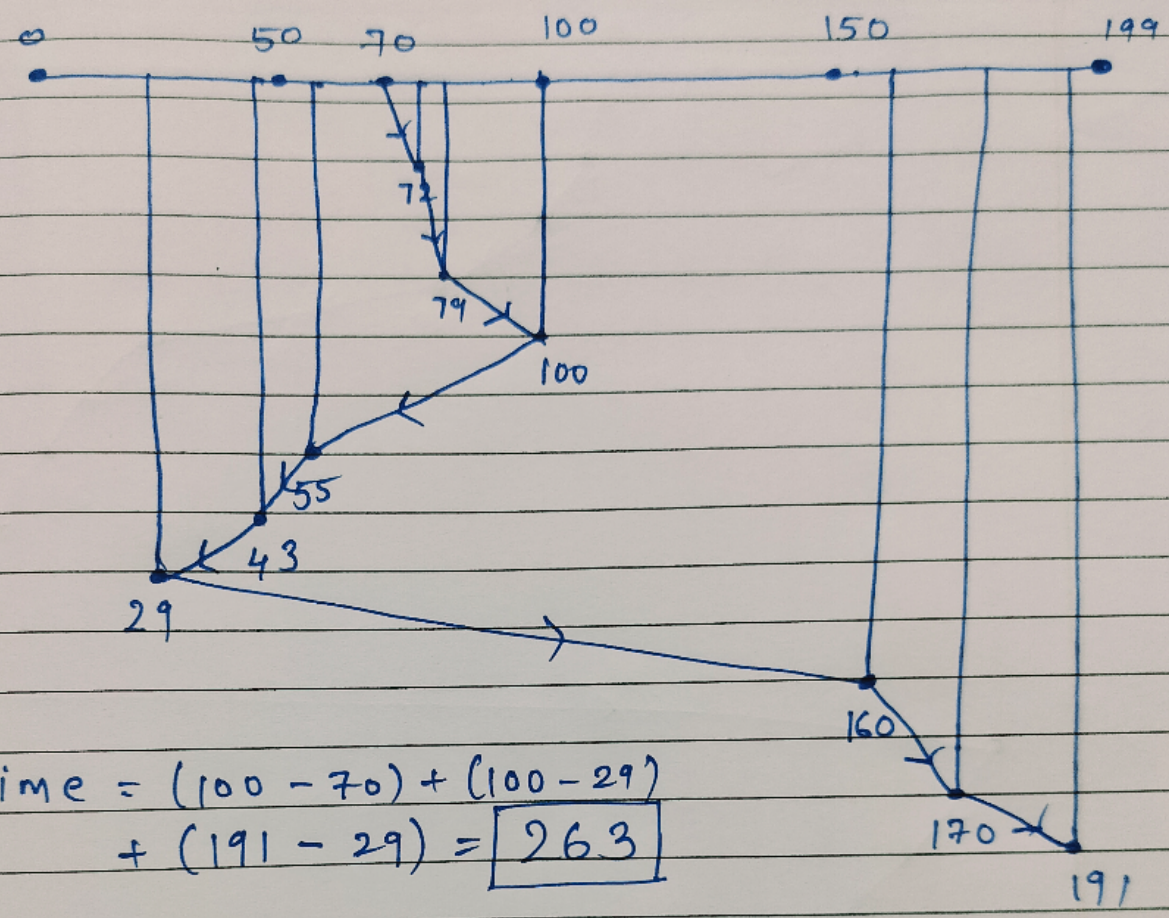
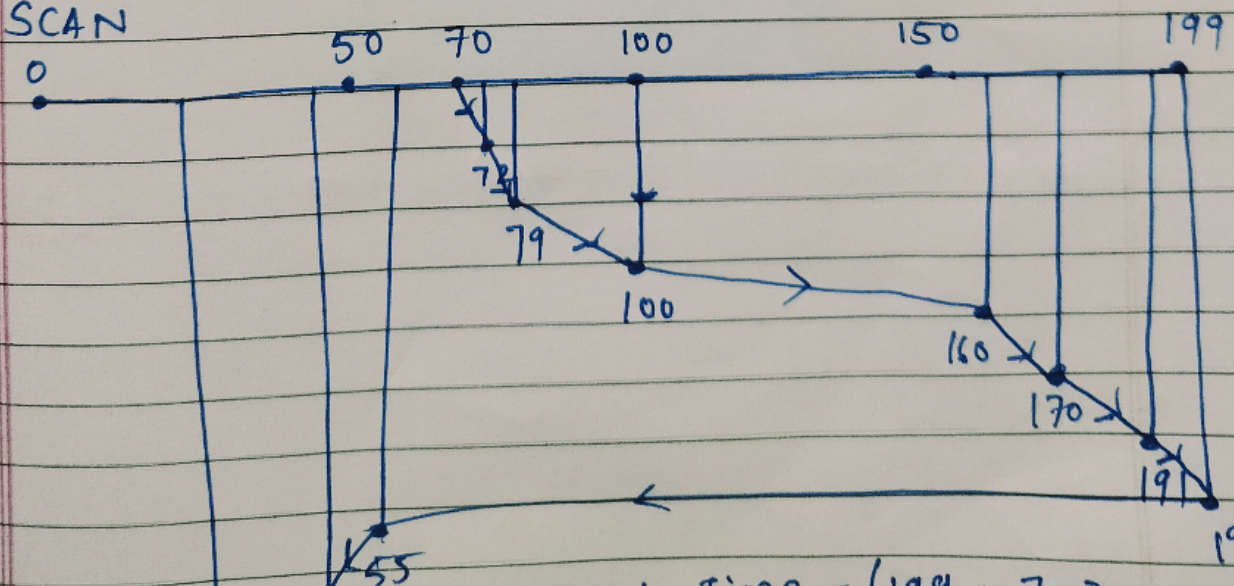
SSTF



Seek Time = (100 − 70) + (100 − 29)
+ (191 − 29) = 263

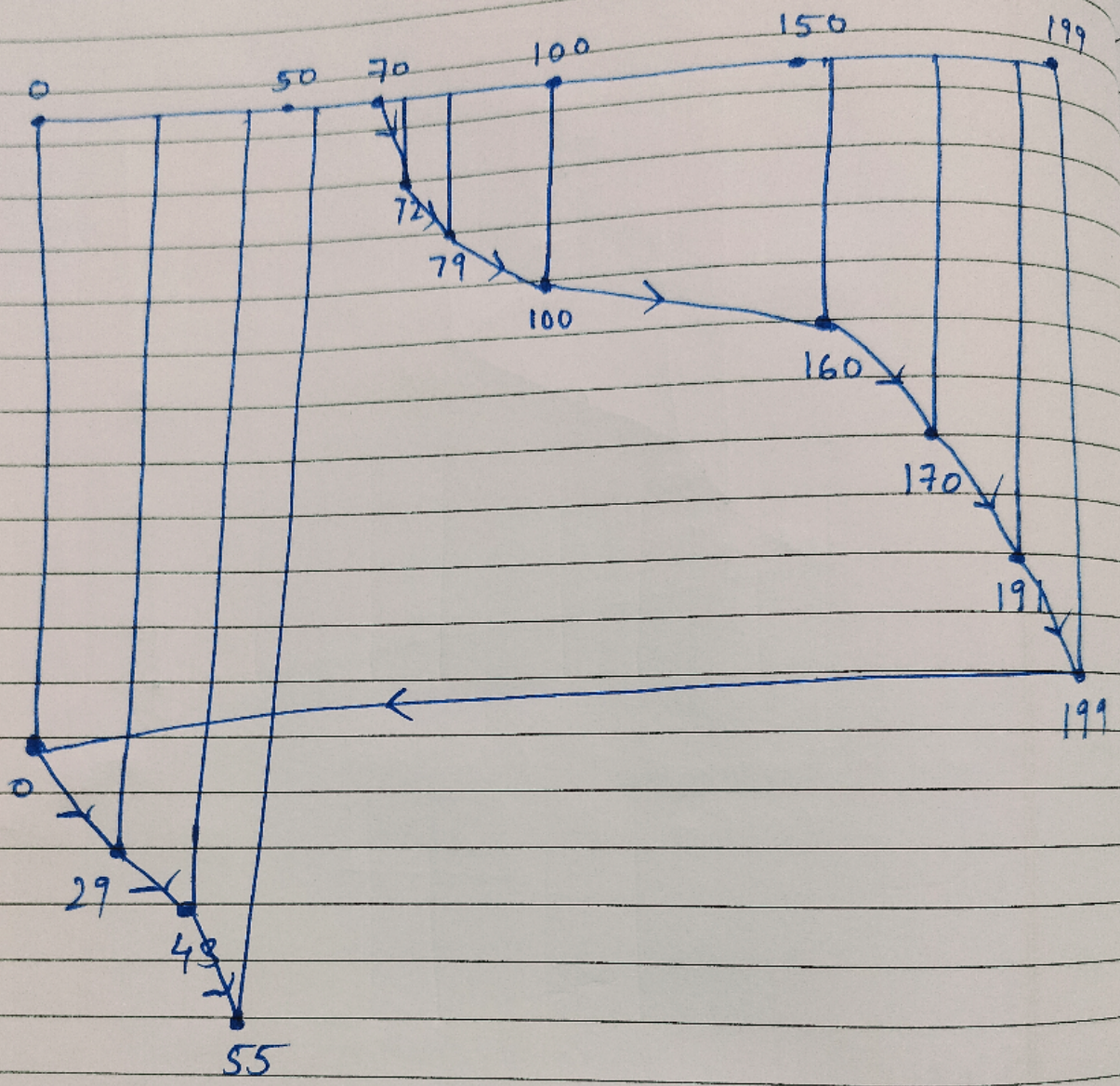
SCAN



Seek Time = (199 − 70) +
(199 − 29) = 299

Teacher's Signature

C-SCAN



Seek Time = (199 - 70) + 199 + 55 = 383

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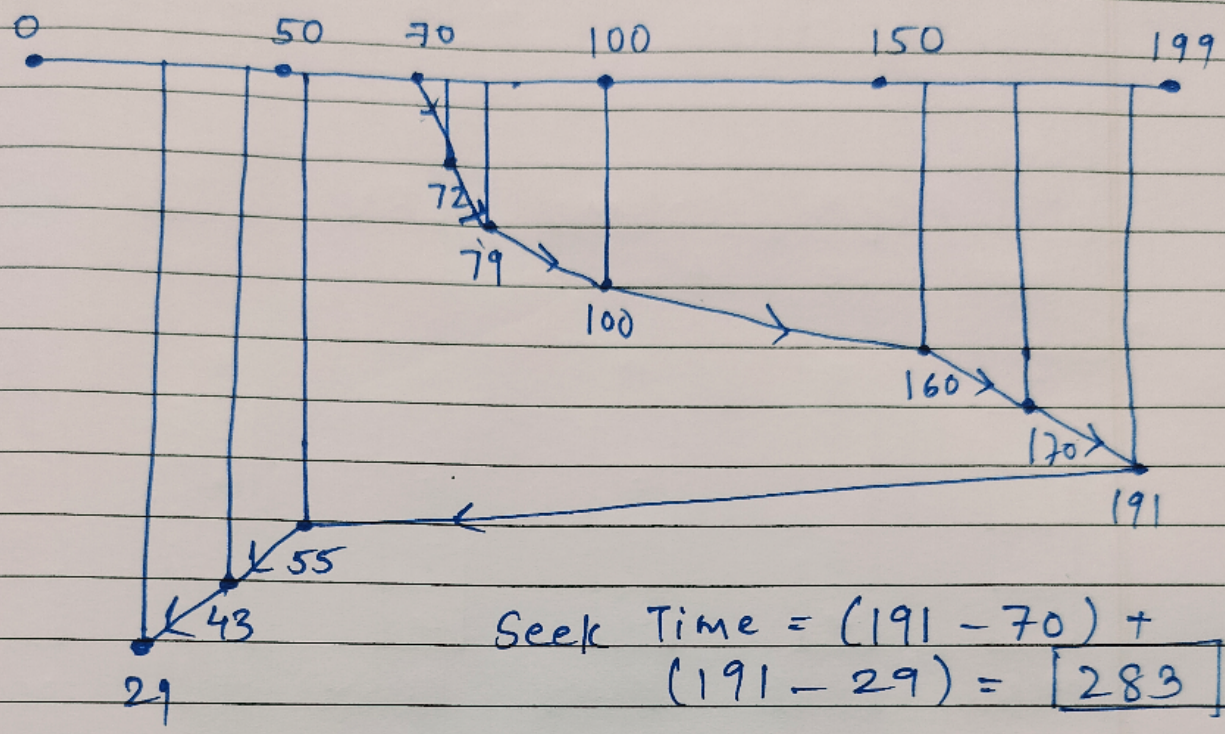
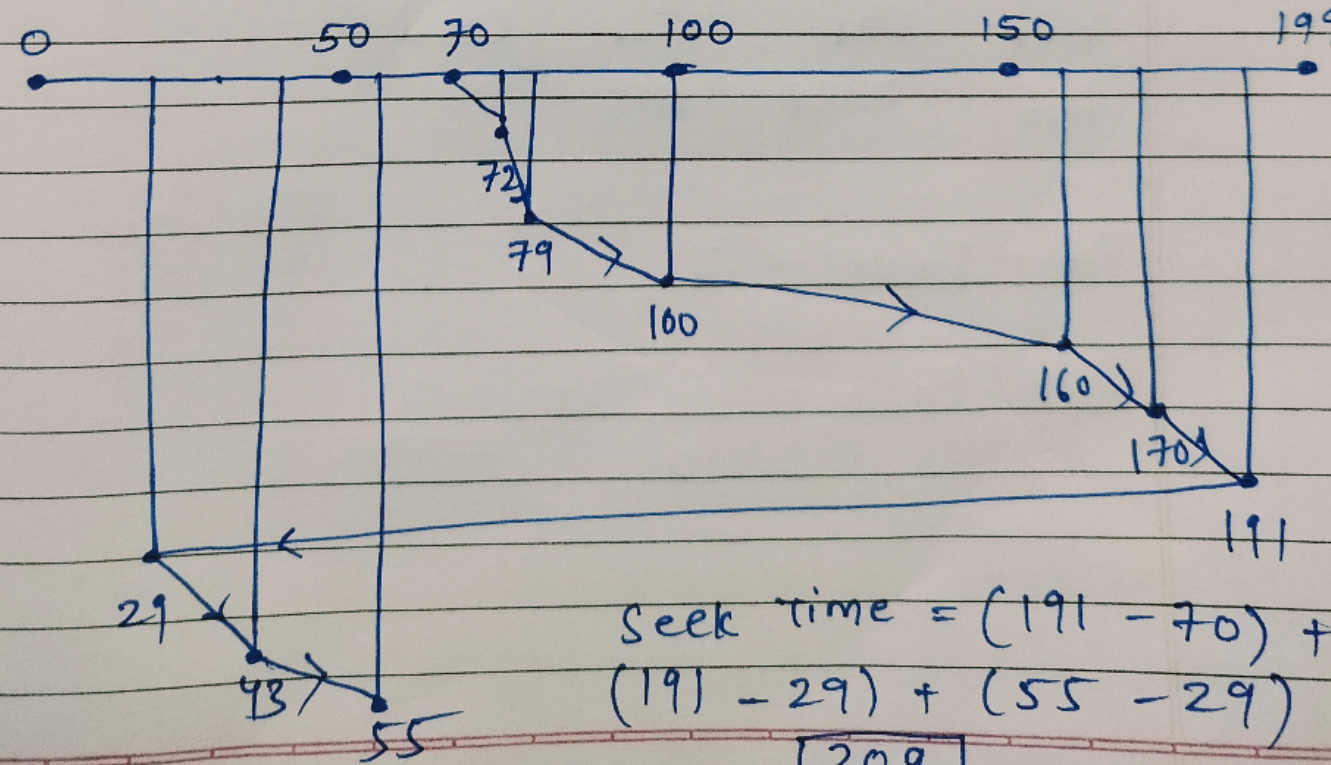
LOOK



Seek Time = (191 − 70) + (191 − 29) = 283

C-LOOK



Seek time = (191 − 70) + (191 − 29) + (55 − 29)

= 309

Teacher's Signature:.....

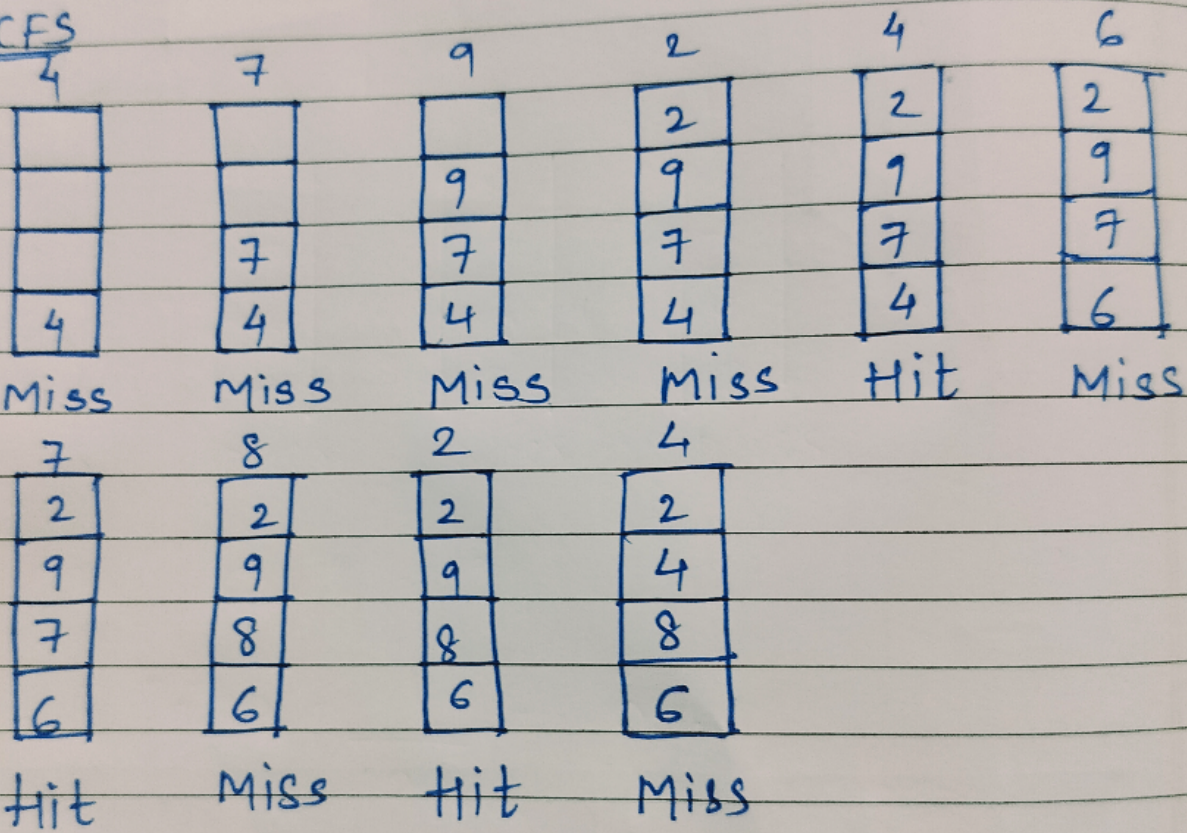
Page Replacement Policies

- Calculate Page Fault and Hit Ratio for the following string: 4, 7, 9, 2, 4, 6, 7, 8, 2, 4

Using :
FCFS, Optimal, LRU
Frame size = 4

Sol

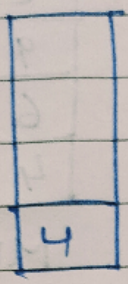
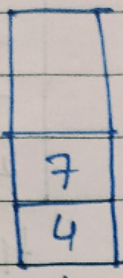
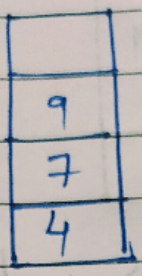
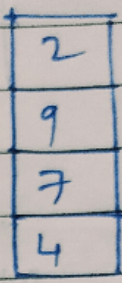
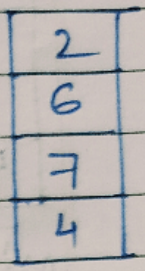
- FCFS

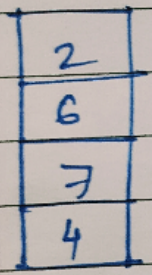
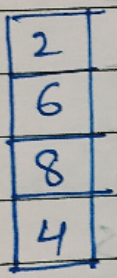
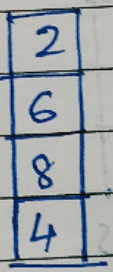
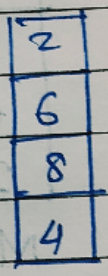


Page Fault = 7

Hit Ratio = $\frac{3}{10} = \underline{\underline{0.3}}$

Optimal

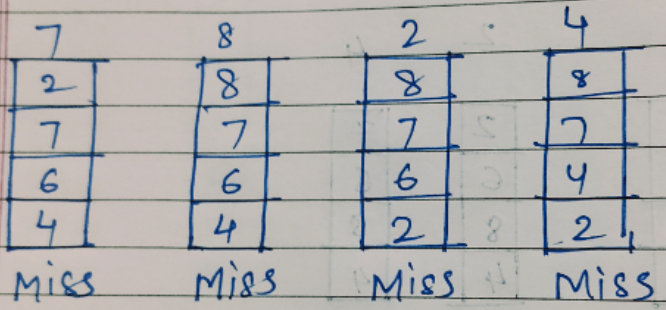
4	7	9	2	4	6
					
Miss	Miss	Miss	Miss	Hit	Miss

7	8	2	4
			
Hit	Miss	Hit	Hit

Page Fault = 6

Hit Ratio = $\frac{4}{10} = \underline{0.4}$

LRU

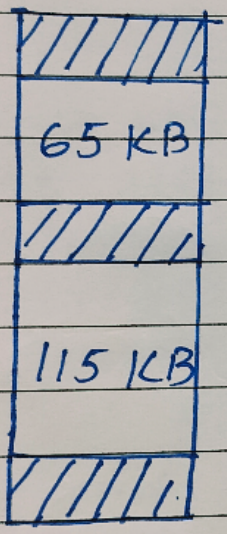


Page Fault = 9

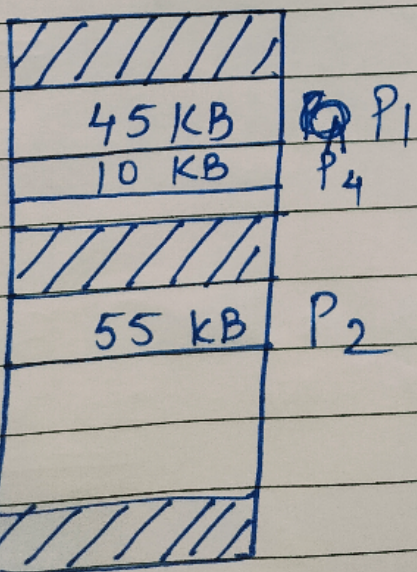
Hit Ratio = $\frac{1}{10} = 0.1$

- Placement Strategies

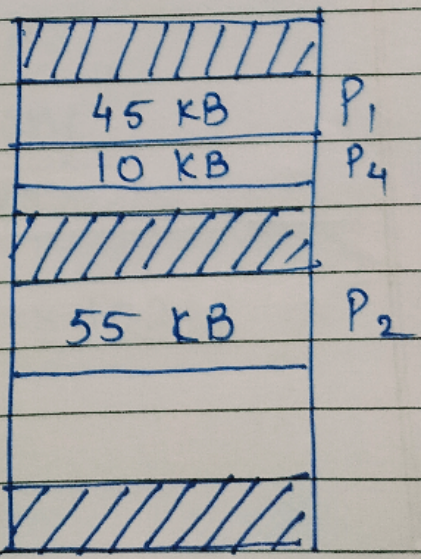
Allocate the process with the following sizes :
P1 = 45 KB
P2 = 55 KB
P3 = 70 KB
P4 = 10 KB
using : First Fit, Best Fit, worst Fit, Next Fit.
in the given memory block :



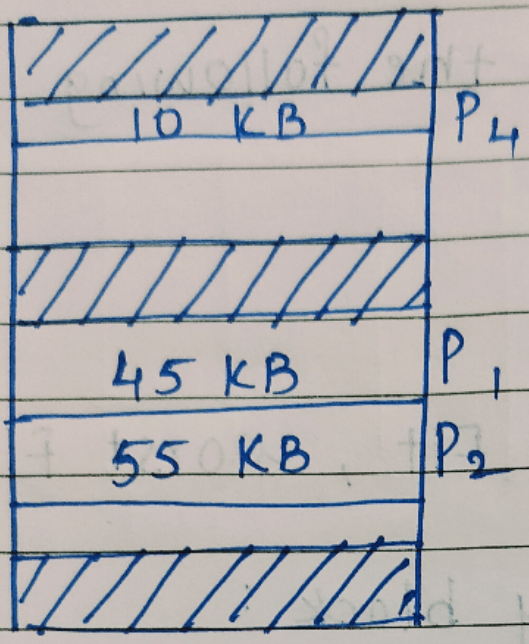
Sol First Fit / Next Fit :



Best Fit :



Worst Fit :



Cache Memory

1) Main memory size = 16 GB , Cache Size = 1 MB
Block size = 16 KB
Word size = 1 Byte
Calculate: (a) Physical address
(b) No. of blocks
(c) Block offset in main memory
(d) No. of lines in cache
(e) No. of tag bits in cache

Using:
Direct mapping
Fully associative
Set associative (assume 4 sets)

Sol Main memory = 16 GB
= 16 × 1024 × 1024 × 1024 Bytes
= 17179869184 Bytes

Physical address size = $\log_2$ (Main memory size)
= $\log_2$ 17179869184
= 34 bits

No. of blocks = $\frac{\text{Main memory}}{\text{Block size}}$

= $\frac{16 \times 1024 \times 1024 \times 1024}{16 \times 1024}$

= 1048576 ~~bits~~ blocks = 2^{20} blocks

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Block offset = $\log_2$ (Block size)

= $\log_2$ (16384)

= 14 bits

No. of lines in cache = $\frac{\text{Cache size}}{\text{Block size}}$

= $\frac{1024 \times 1024}{16 \times 1024}$ = 64 lines

Direct mapping

Index bits = $\log_2$ (no. of cache lines)

= $\log_2$ (64) = 6 bits

Tag bits = Total address bits − (Index bits + Block offset bits)

= 34 − (6 + 14) = 34 − 20 = 14 bits

Fully associative

Tag bits = Total address bits − Block offset bits = 34 − 14 = 20 bits

Set associative (Assume 4 sets).

No. of sets = $\frac{\text{No. of cache lines}}{\text{No. of sets}}$

$= \frac{64}{4} = 16$ sets

Set Index Bits = $\log_2$ (No. of sets)

$= \log_2 16 = 4$ bits

Tag bits = Total address bits - (Set Index bits + Block offset bits)

$= 34 - (4 + 14) = 16$ bits