

1) Allocation request for

200, 625, 348, 475, 150

all are in KB

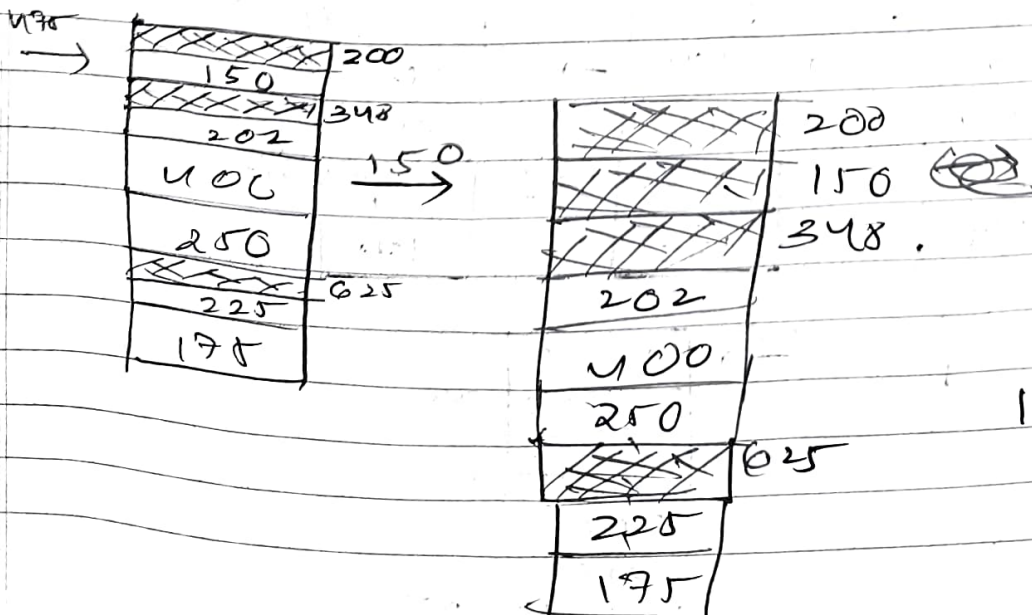
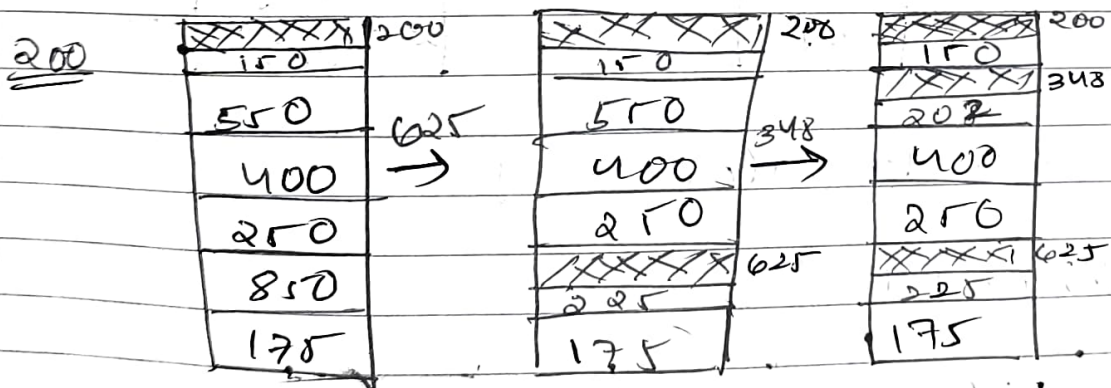
Memory, initial all positions are available

in KB

350
550
400
250
850
175

Best Fit → First Fit → Worst Fit

a) First Fit



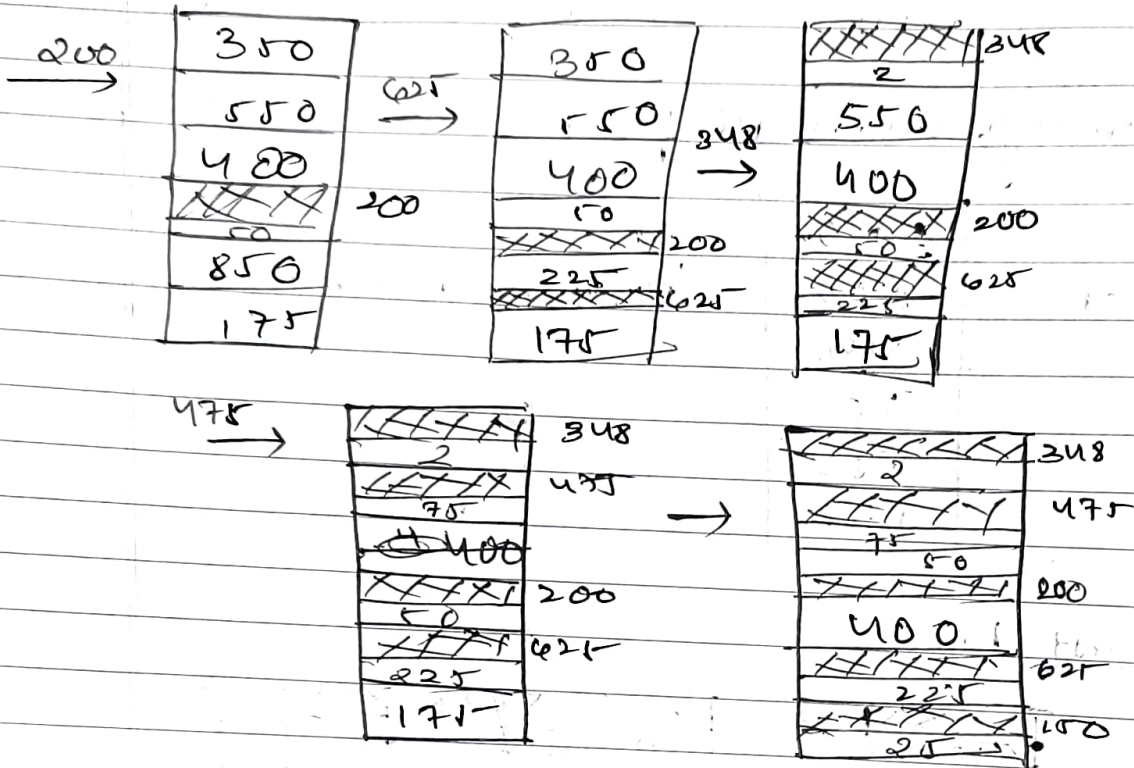
1323 allocated

21 May 2019

Debarshi Jena

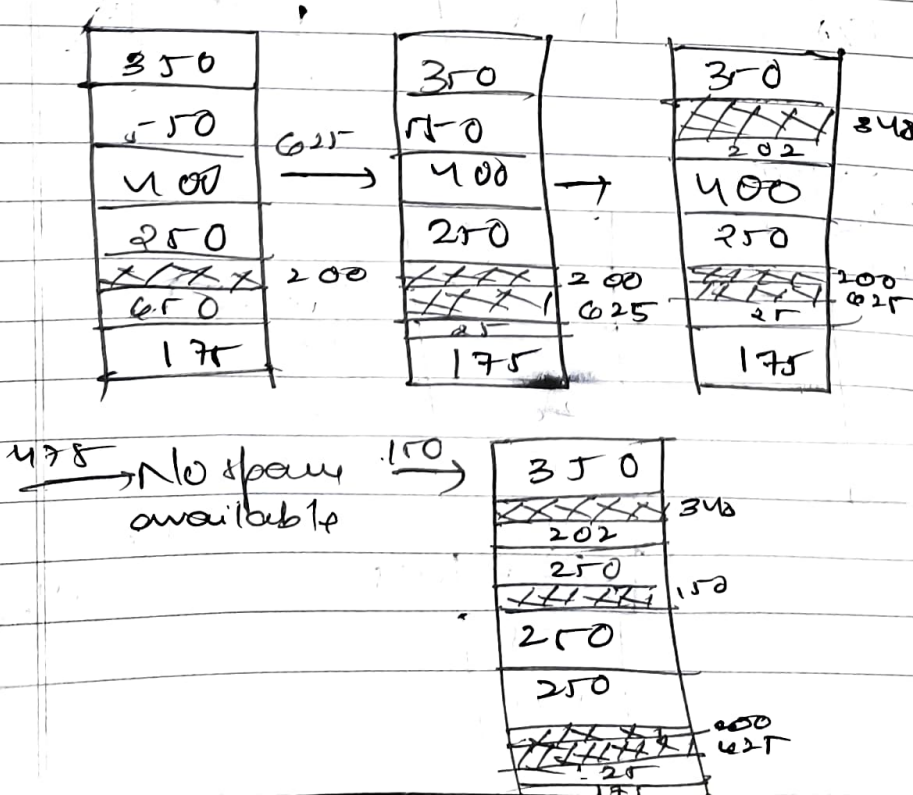
Page

Best Fit



1798 KB allocated

Worst Fit:



3) ① MAX

A	B	C	D
7	0	2	1
1	6	5	0
3	3	4	6
1	5	6	2
2	4	3	2
<u>14</u>	<u>18</u>	<u>20</u>	<u>11</u>

Add maximum type:

7 + 1 + 3 + 1 + 2 = 14 — type A.

18 — type B

20 — type C

11 → type D

② need = max - allocation

Max				Allocation				Need			
A	B	C	D	A	B	C	D	A	B	C	D
7	0	2	1	4	0	0	1	3	0	2	0
1	6	5	0	1	1	0	0	0	5	5	0
3	3	4	6	1	0	4	5	2	3	0	1
1	5	6	2	0	4	2	1	1	1	4	1
2	4	3	2	0	3	1	1	2	1	2	0

Explanation:

A	B	C	D
$7-4=3$	$0-0=0$	$2-0=2$	$1-1=0$
$1-1=0$	$6-1=5$	$5-0=5$	$0-0=0$
$3-1=2$	$3-0=3$	$4-4=0$	$6-5=1$
$1-0=1$	$5-4=1$	$6-2=4$	$2-1=1$
$2-0=2$	$4-3=1$	$3-1=2$	$2-2=0$

Need matrix

A	B	C	D
3	0	2	0
6	5	5	0
2	3	0	1
1	1	4	1
2	1	2	0

② Sequence
P₀

$$\text{Available} = \text{Available} + \text{Allocation}$$

$$= 3221 + 4001$$

$$= 3+4, 2+0, 2+0, 1+1$$

$$= 7, 2, 2, 2$$

$$\text{Available} = 7 \ 2 \ 2 \ 2$$

$P_1 \Rightarrow \text{need} \leq \text{available}$

0 5 5 0 \leq 7 2 2 2

$0 \leq 7, 5 \leq 2, 5 \leq 2, 0 \leq 2$

False

Check P_2 ,

2 3 0 1 \leq 7 2 2 2

$2 \leq 7, 3 \leq 2, 0 \leq 2, 1 \leq 2$

It is not possible as $3 \leq 2$ is false.

Check P_2

$\text{need} \leq \text{available}$

1 1 4 1 \leq 7 2 2 2

$1 \leq 7, 1 \leq 2, 4 \leq 2, 1 \leq 2$

Not possible

Check for P_4

2 1 1 0 \leq 7 2 2 2

$2 \leq 7, 1 \leq 2, 1 \leq 2, 0 \leq 2$

all are true, so next sequence P_4

Sequence P_0, P_4

$$\begin{aligned} \text{available} &= \text{available} + \text{allocation} \\ &= 7 \ 2 \ 2 \ 2 \ 4 \ 0 \ 3 \ 2 \ 1 \\ &= 7 \ 5 \ 4 \ 3 \end{aligned}$$

Again for P_1

0 5 5 0 \leq 7 5 4 3

$0 \leq 7, 5 \leq 5, 5 \leq 4, 0 \leq 3$
false

Again for P_2

2 3 0 1 \leq 7 5 4 3

$2 \leq 7, 3 \leq 5, 0 \leq 4, 1 \leq 3$

All are true so next sequence is P_2

Sequence: $P_0 P_4 P_2$

21Buy10089
Diebstahl Jena

$$\text{available} = 7 + 4 + 10 + 5 \dots$$
$$= 8588$$

check for P_3

$$0 \ 4 \ 2 \ 1 \leq 8588$$

all are true, so sequence is: $P_0 P_4 P_2 P_3$

Available: $8588 + 0421$

$$F \ 8 \ 9 \ 10 \ 9$$

checking again for P_1

$$0 \ 5 \ 5 \ 0 \leq 8 \ 9 \ 10 \ 9$$

All are true so next is P_1

Final sequence: $P_0 P_4 P_2 P_3 P_1$

④ $\{0, 2, 0, 0\}$ additional resources for P_2

Already P_2 need $2 \ 3 \ 0 \ 1$

$$\begin{array}{r} 2 \ 3 \ 0 \ 1 \\ + \ 0 \ 2 \ 0 \ 0 \\ \hline 2 \ 5 \ 0 \ 1 \end{array}$$

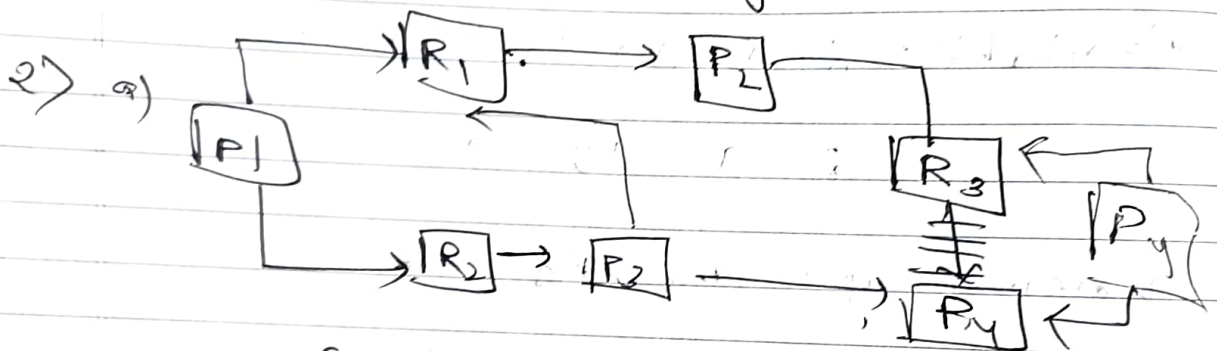
Available resources are only : 7 2 2 2

2 5 0 1 \leq 7 2 2 2

2 \leq 7, 5 \leq 2, 0 \leq 2, 1 \leq 2

→ False

So, algorithm grant the request immediately not possible



Resource allocation graph

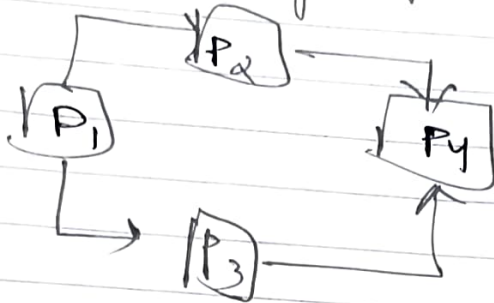
b) We can see the cycle

$P_1 \rightarrow R_2 \rightarrow P_3 \rightarrow R_1 \rightarrow P_2 \rightarrow R_3 \rightarrow P_1$

indicating a potential deadlock
The involved cycle are P_1, P_2, P_3

c) We need at least one process in the cycle. It could be any cycle $\{P_1, P_2, P_3\}$

d) Wait for graph



If there exist a loop in wait for graph, such that we can start from a process and end on the same process, then circular wait is present in the wait for graph.