CSE321

Take Home Quize

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sec: 8 (SUW)

spring 24

CamScanner

Ans to no 1

(i)

	Allocation R_1 R_2 R_3	Max R_1 R_2 R_3	Available R_1 R_2 R_3	need R_1 R_2 R_3
P_0	2 5 0	8 5 9	10 7 7	6 0 9
P_1	1 1 1	5 6 8		4 5 7
P_2	2 5 2	6 10 8		4 5 6
P_3	4 0 3	5 6 10		1 6 7
P_4	0 3 0	9 5 9		9 2 9

Finish :

P_0	P_1	P_2	P_3	P_4
F	~~F~~ T	~~F~~ T	~~F~~ T	~~F~~ T

sequence : $P_1 \rightarrow P_2 \rightarrow P_3 \rightarrow P_4 \rightarrow P_0$

1. P_0 : No allocation
2. P_1 : Allocate
   work = | 11 | 8 | 8 |
3. P_2 : Allocate work = | 13 | 13 | 10 |
4. P_3 : Allocate work = | 17 | 13 | 13 |
5. P_4 : Allocate work = | 17 | 16 | 13 |
6. P_0 : Allocate work = | 19 | 21 | 13 |

∴ The state is safe :

$P_1 \rightarrow P_2 \rightarrow P_3 \rightarrow P_4 \rightarrow P_0$

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(ii) Request = [0, 2, 7]

For P_3: (1) Available = [10, 5, 0]

(2) Allocated = [4, 2, 10]

(3) need = [1, 4, 0]

Banker's algorithm:

	P_0	P_1	P_2	P_3	P_4
f =	~~F~~ T	~~F~~ T	~~F~~ T	~~F~~ T	~~F~~ T

seq = $P_3 \Rightarrow P_4 \rightarrow P_0 \rightarrow P_1 \rightarrow P_2$

(1) P_0: 6, 0, 9 $\nless$ 10, 5, 0

(2) P_1: 4, 5, 7 $\nless$ 10, 5, 0

(3) P_2: 4, 5, 6 $\nless$ 10, 5, 0

(4) P_3: 1, 4, 0 < 10, 5, 0 : Allocate

work = [14, 7, 10]

(5) P_4: 9, 2, 9 < 14, 7, 10 : Allocate

work = [14, 10, 10]

(6) P_0: 6, 0, 9 < 14, 10, 10 : Allocate

W = [16, 15, 10]

(7) P_1: 4, 5, 7 < 14, 10, 10 : Allocate

W = [17, 16, 11]

(8) P_2: 4, 5, 6 < 14, 10, 10 : Allocate

W = [19, 21, 13]

∴ yes system remain safe.

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(i)

Ans to qr 2

	Need			Available		
	R_1	R_2	R_3	R_1	R_2	R_3
P_0	10	5	3	2	5	7
P_1	4	3	3			
P_2	2	3	2			
P_3	2	3	2			
P_4	3	8	6			

$f = [F_T \,|\, F_T \,|\, F_T \,|\, F_T \,|\, F_T]$ (P_0, P_1, P_2, P_3, P_4) $W = [2, 5, 7]$

seqr = $P_2 \rightarrow P_3 \rightarrow P_4 \rightarrow P_0 \rightarrow P_1$

① P_0 : $10, 5, 3 \nless 2, 5, 7$

② P_1 : $4, 3, 3 \nless 2, 5, 7$

③ P_2 : $2, 3, 2 \leq 2, 5, 7$: $W = [5+2, 4+5, 5+7]$
$= [7, 9, 12]$

④ P_3 : $2, 3, 2 \leq 7, 9, 12$: Allocate
$W = [7+3, 9+2, 5+12] = [10, 11, 17]$

⑤ P_4 : $3, 8, 6 \leq 10, 11, 17$: allocate
$W = [10+3, 11+2, 17] = [13, 13, 17]$

⑥ P_0 : $10, 5, 3 \leq 13, 13, 17$: allocate
$W = [13, 13+2, 17+3] = [13, 15, 20]$

⑦ P_1 : $4, 3, 3 \leq 13, 15, 20$:
$W = [15, 18, 22]$

$\therefore$ safe state : $P_2 \rightarrow P_3 \rightarrow P_4 \rightarrow P_0 \rightarrow P_1$

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(ii) for P_3 : $P_3 <$ Need, $P_3 <$ Available

	Allocation	Available	need
P_3 :	$[0, 2+1, 2+3]$	$[2, 5-1, 7-2]$	$[2, 3-1, 2-2]$
	$= [0, 3, 5]$	$[2, 4, 5]$	$[2, 2, 0]$

$$F = \begin{array}{ccccc} 0 & 1 & 2 & 3 & 4 \\ \hline \cancel{F} & \cancel{F} & \cancel{F} & \cancel{F} & \cancel{F} \end{array} \qquad W = [2, 4, 5]$$

$S \Rightarrow P_2 \rightarrow P_3 \rightarrow P_4 \rightarrow P_0 \rightarrow P_1$

1. P_0 : $10, 5, 3 \not< 2, 4, 5$
2. P_1 : $4, 3, 3 \not< 2, 4, 5$
3. P_2 : $2, 3, 2 < 2, 4, 5$: $W = [2+5, 4+4, 5+5]$
   $= [7, 8, 10]$
4. P_3 : $2, 2, 0 < 7, 8, 10$: Allocate
   $W = [7, 8+3, 10+5] = [7, 11, 15]$
5. P_4 : $3, 8, 6 < 7, 11, 15$: Allocate
   $W = [7+3, 11+2, 15] = [10, 13, 15]$
6. P_0 : $10, 5, 3 \leq 10, 13, 15$:
   $W = [10, 15, 18]$
7. P_1 : $4, 3, 3 \leq 10, 15, 18$:
   $W = [10+2, 15+3, 18+2]$
   $= [12, 18, 20]$

$\therefore$ Yes, system in safe state

$P_2 \rightarrow P_3 \rightarrow P_4 \rightarrow P_0 \rightarrow P_1$

(1) Ans to Q 3

Need

	R_1	R_2	R_3
P_0	5	6	2
P_1	5	9	0
P_2	5	6	5
P_3	3	9	3
P_4	1	7	0

$W = [2, 9, 1]$

	0	1	2	3	4
$F =$	$\cancel{F}$	$\cancel{F}$	$\cancel{F}$	$\cancel{F}$	$\cancel{F}$

$S: P_4 \to P_0 \to P_1 \to P_2 \to P_3$

① $P_0 : 5, 6, 2 \nless 2, 9, 1$

② $P_1 : 5, 9, 0 \nless 2, 9, 1$

③ $P_2 : 5, 6, 5 \nless 2, 9, 1$

④ $P_3 : 3, 9, 3 \nless 2, 9, 1$

⑤ $P_4 : 1, 7, 0 < 2, 9, 1$: Allocate

$W = [4+2, 1+9, 5+1] = [6, 10, 6]$

⑥ $P_0 : 5, 6, 2 < 6, 10, 6$:

$W = [5+6, 1+10, 5+6] = [11, 11, 11]$

⑦ $P_1 : 5, 9, 0 < 11, 11, 11$:

$W = [3+11, 11, 5+11] = [14, 11, 16]$

⑧ $P_2 : 5, 6, 5 < 14, 11, 16$:

$W = [14, 1+11, 4+16] = [14, 12, 20]$

⑨ $P_3 : 3, 9, 3 < 14, 12, 20$:

$W = [18, 13, 22]$

safe state : $P_4 \to P_0 \to P_1 \to P_2 \to P_3$

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(ii) P_0 request = [2, 3, 0] < need
≤ available

	allocated	available	need
P_0	[7, 4, 5]	[0, 6, 1]	[3, 3, 2]

f = | F | F | F | F | F | S :

W = [0, 6, 1]

(1) P_0 : 3, 3, 2 ≮ 0, 6, 1

(2) P_1 : 5, 9, 0 ≮ 0, 6, 1

(3) P_2 : 5, 6, 5 ≮ 0, 6, 1

(4) P_3 : 3, 9, 3 ≮ 0, 6, 1

(5) P_4 : 1, 7, 0 ≮ 0, 6, 1

second iteration same result

∴ No, the system doesn't remain in safe state if request approved.

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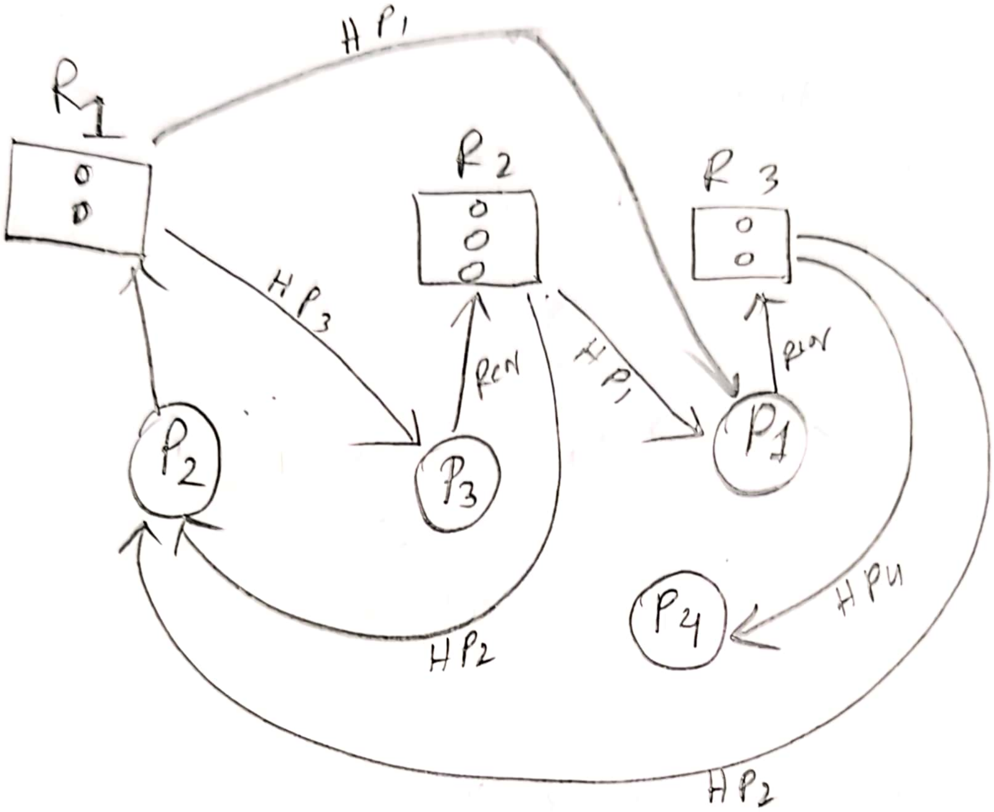
Ans to Q 4



In this graph no mutual exclusion condition holds which is why there is no possibility of deadlock.

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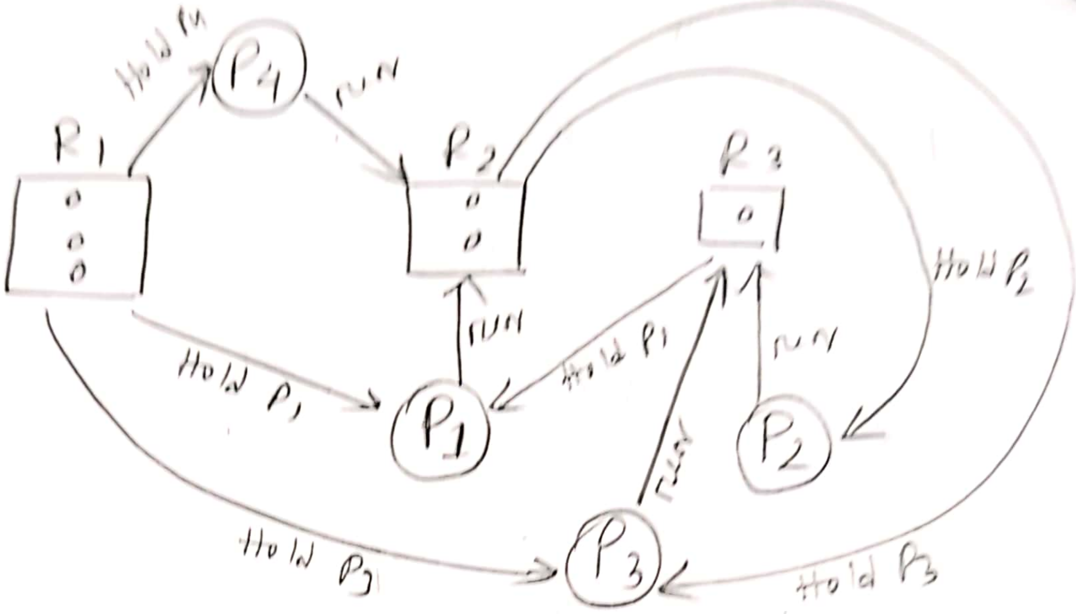
Ans to Q 5



conditions exist:

1. Mutual exclusion : R3 has one resource
2. Hold and wait : ex: P4 holds R1, run for R2
3. No preemtion.
4. Circular wait:

ex: P1 → R2 → P2 → R3 → P1

∴ Hence, possibility of deadlock exist.

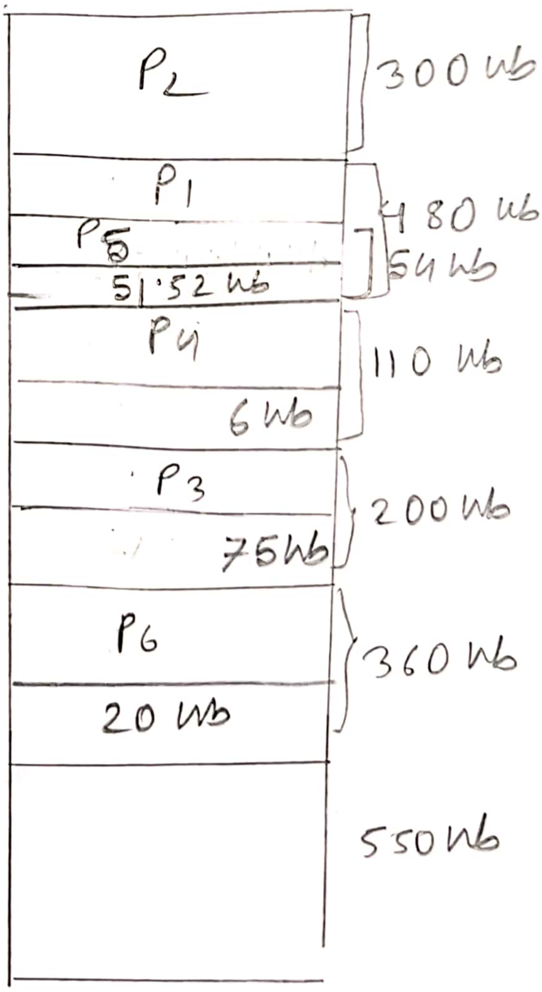
Main Memory Allocation

(1)

(i) First fit :

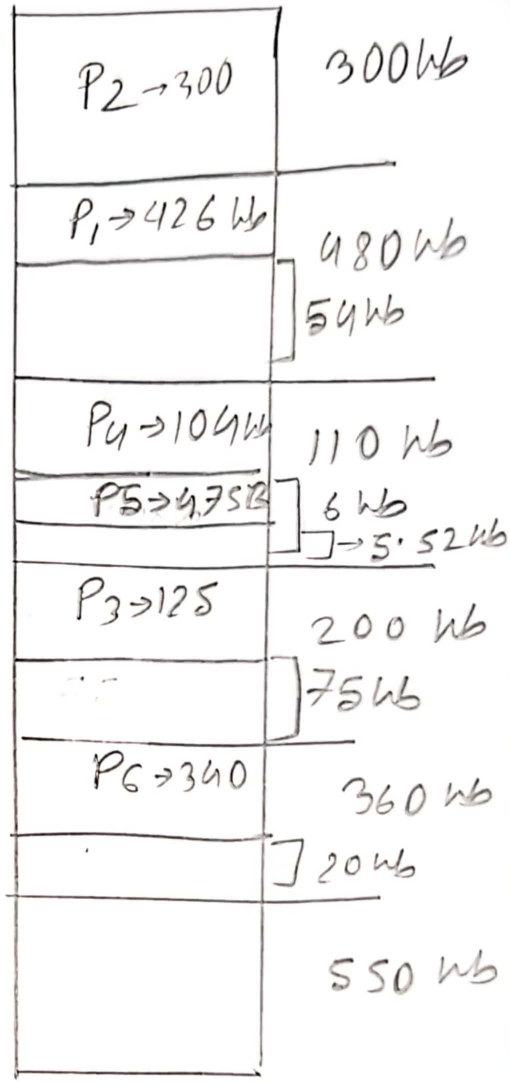
Process	space	(kb) Allocated to	(kb) waste/hole
P_1	426 kb	480 kb	54 kb
P_2	300 kb	300 kb	0 kb
P_3	125 kb	200 kb	75 kb
P_4	104 kb	110 kb	6 kb
P_5	475 b	54 kb	51.52 kb
P_6	340 kb	360 kb	20 kb

∴ There exists external fragmentation for allocation of future processes as there are holes in between allocated processes.



(ii) Best fit:

P	is	Allocated to	hole
P_1	426kb	480kb	54kb
P_2	300kb	300	0
P_3	125kb	200	75
P_4	104kb	110	6
P_5	475B	6kb	5.52
P_6	340	360	20



∴ As holes between process exits, external fragmentation exists.

Compare:

① (i) First fit biggest continuous space

= 550+20 = 570 kb

(ii) Best fit = 570 kb

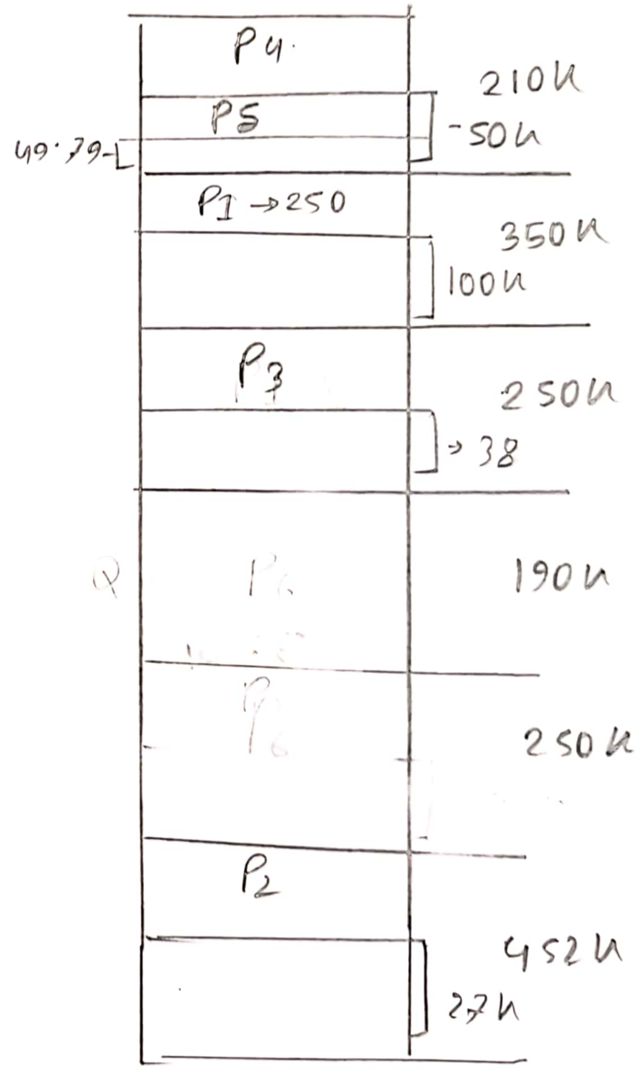
② Comparing other aspects in first fit, allocating P5 created 5.52 kb waste and in best fit it created 5.1 kb waste.

Hence, best fit is more effective.

② (1) First fit :

P	space		space allocated	waste
P1	250k	—	350	100
P2	425k	—	452	27
P3	212k	—	220	
P4	160k			38
P5	210b	—	210	
P6	440k	-	50	50
				49.79
			10 X	0 X

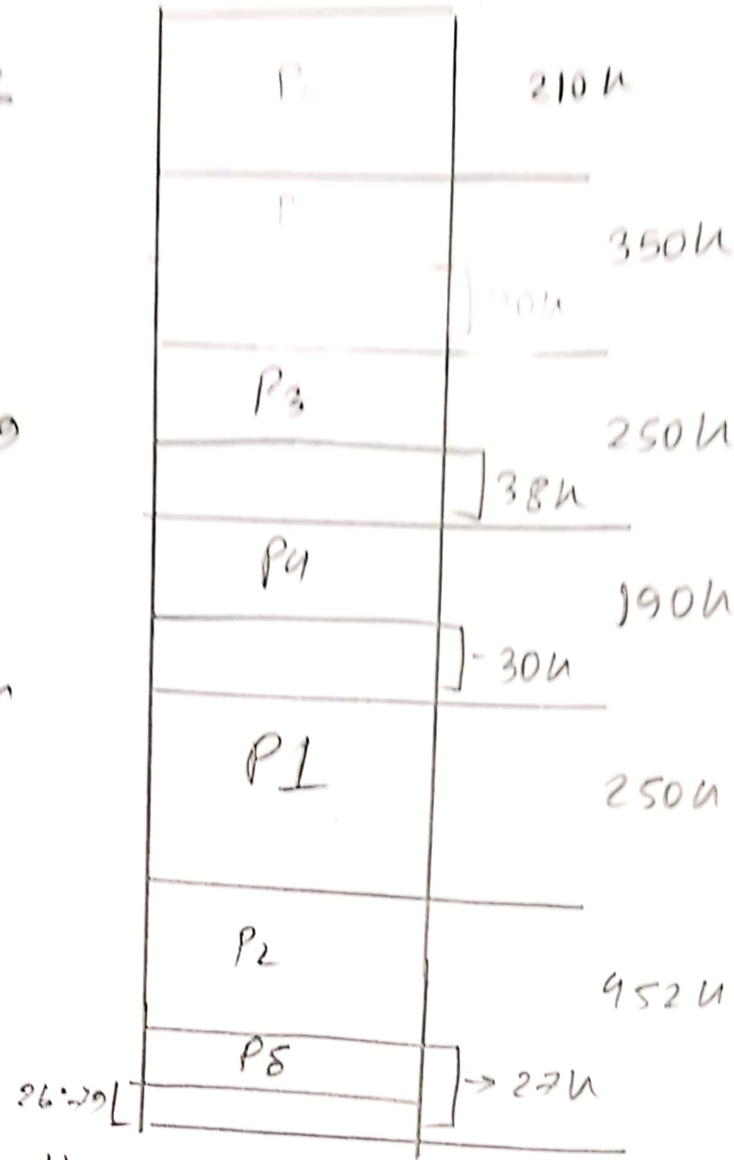
∴ External fragmentation exists as holes exist in between allocated processes.



(ii) Best fit

P	Allocated to	hole
P_1	250	0
P_2	452	22
P_3	250	38
P_4	190	30
P_5	27	26.29
P_6	×	×

∴ External fragmentation exists.



Compare

① First fit biggest continuous space = 38 + 190 + 250 = 478 kb

② Best fit biggest continuous space = 210 + 350 kb

∴ Best fit is more efficient.