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Sub / sem : CSE3003 / Fall 2021-22

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TUTORIAL - 3

(1)

1 (a) 7 0 1 2 0 3 0 4 2 3 5 3 2 1 2 0 1 7 0 1

f_2			1	1	1	1	[0]	0	0	[3]	3	3	3	3	[2]	2	2	2	2	[1]
f_1		0	0	0	0	[3]	3	3	[2]	2	2	2	2	[1]	1	1	1	[7]	7	7
f_0	7	7	7	[2]	2	2	2	[4]	4	4	[5]	5	5	5	5	[0]	0	0	0	0
	f	f	f	f	H	f	f	f	f	f	f	H	H	f	f	f	H	f	H	f

Fault ratio = $\frac{15}{20} \times 100 = \frac{3}{4} \times 100 = 75\%$

Hit ratio = $\frac{5}{20} \times 100 = 25\%$

LRU

f_2			1	1	1	[3]	3	3	[2]	2	2	2	2	2	2	2	2	[7]	7	7
f_1		0	0	0	0	0	0	0	0	[3]	3	3	3	3	3	[0]	0	0	0	0
f_0	7	7	7	[2]	2	2	2	[4]	4	4	[5]	5	5	[1]	1	1	1	1	1	1
	f	f	f	f	H	f	H	f	f	f	f	H	H	f	H	f	H	f	H	H

Fault ratio = $\frac{12}{20} \times 100 = 60\%$

Hit ratio = $\frac{8}{20} \times 100 = 40\%$

Optimal

f_2			1	1	1	[3]	3	3	3	3	3	3	[1]	1	1	1	1	1	1	1
f_1		0	0	0	0	0	0	[4]	4	4	[5]	5	5	5	5	5	[7]	7	7	7
f_0	7	7	7	[2]	2	2	2	2	2	2	2	2	2	2	[0]	0	0	0	0	0
	f	f	f	f	H	f	H	f	H	H	f	H	H	f	H	f	H	f	H	H

Fault ratio = $\frac{10}{20} \times 100 = 50\%$

Hit ratio = $\frac{10}{20} \times 100 = 50\%$

(b) 1, 2, 3, 4, 5, 1, 3, 1, 6, 3, 2, 3

(2)

FIFO:

f_2			3	3	3	[1]	1	1	1	1	[2]	2
f_1		2	2	2	[5]	5	5	5	[6]	6	6	6
f_0	1	1	1	[4]	4	4	[3]	3	3	3	3	3
	f	f	f	f	f	f	f	H	f	H	f	H

Fault ratio $= \frac{9}{12} \times 100 = 75\%$

Hit ratio $= \frac{3}{12} \times 100 = 25\%$

LRU →

f_2			3	3	3	[1]	1	1	1	1	[2]	2
f_1		2	2	2	[5]	5	5	5	[6]	6	6	6
f_0	1	1	1	[4]	4	4	[3]	3	3	3	3	3
	f	f	f	f	f	f	f	H	f	H	f	H

Fault ratio = 75 %

Hit ratio = 25 %

Optimal

f_2			3	3	3	3	3	3	3	3	3	3
f_1		2	2	4	5	5	5	5	5	5	2	2
f_0	1	1	1	1	1	1	1	1	6	6	6	6
	f	f	f	f	f	H	H	H	f	H	f	H

Fault ratio $= \frac{7}{12} \times 100 = 58.3\%$

Hit ratio $= \frac{5}{12} \times 100 = 41.6\%$

(c) 5, 0, 1, 2, 0, 3, 5, 1, 2, 0, 3, 3, 2; 1, 4, 0, 1, 7, 2, 1

→ FIFO

f_2		1	1	1	1	**5**	5	5	**0**	0	0	0	0	**4**	4	4	4	**2**	2
f_1	0	0	0	0	**3**	3	3	**2**	2	2	2	2	**1**	1	1	1	**7**	7	7
f_0	5	5	**2**	2	2	2	**1**	1	1	**3**	3	3	3	3	**0**	0	0	0	**1**
	f	f	f	f	H	f	f	f	f	f	f	H	H	f	f	f	H	f	f	f

Fault ratio = $\frac{16}{20} \times 100 = 80\%$

Hit ratio = $\frac{4}{20} \times 100 = 20\%$

→ LRU :

f_2		1	1	1	3	3	3	2	2	2	2	2	2	2	0	0	0	2	2
f_1	0	0	0	0	0	0	1	1	1	3	3	3	3	4	4	4	7	7	7
f_0	5	5	5	2	2	2	5	5	5	0	0	0	0	1	1	1	1	1	1
	f	f	f	f	H	f	f	f	f	f	f	H	H	f	f	f	H	f	f	H

Fault ratio = $\frac{15}{20} \times 100 = 75\%$

Hit ratio = $\frac{5}{20} \times 100 = 25\%$

→ optimal :

f_2		1	2	2	2	2	2	2	2	2	2	2	2	2	4	4	4	4	2	2
f_1	0	0	0	0	3	3	3	3	3	3	3	3	3	1	1	1	1	1	1	1
f_0	5	5	5	5	5	5	5	1	1	0	0	0	0	0	0	0	0	7	7	7
	f	f	f	f	H	f	f	f	f	f	f	H	H	f	f	f	H	f	f	H

Fault ratio = $\frac{11}{20} \times 100 = 55\%$

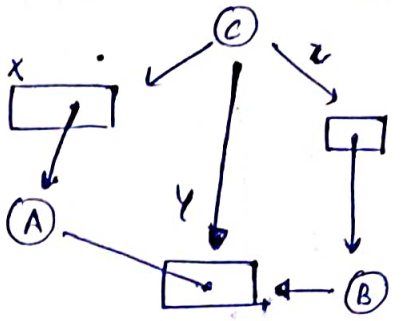
Hit ratio = $\frac{9}{20} \times 100 = 45\%$

(I) For (A) Graph to Matrix

allocation →

	X	Y	Z
A	1	1	0
B	0	0	1
C	0	0	0
	1	1	1

X	Y	Z
1	1	1



Requesting :

	X	Y	Z
A	0	0	0
B	0	1	0
C	1	1	1

Current availability ⇒ (1 1 1) - (1 1 1) = (0 0 0)

(A) 0 0 0 (current availability)

0 0 0 (allocated)

0 0 0

+ 1 1 0 (released) → 0 0 0
+ 1 1 0
1 1 0

CA 1 1 0

(B) 1 1 0 (Current availability)

− 0 1 0 (allocated)

1 0 0

+ 0 1 1 (released) → 0 1 0
+ 0 0 1
0 1 1

(CA) ← 1 1 1

(C) 1 1 1 Current availability

1 1 1 allocated

0 0 0

+ 1 1 1 released → 1 1 1
0 0 0
1 1 1

(A) ← 1 1 1

safe sequence : (A - B - C)

(b) allocation matrix

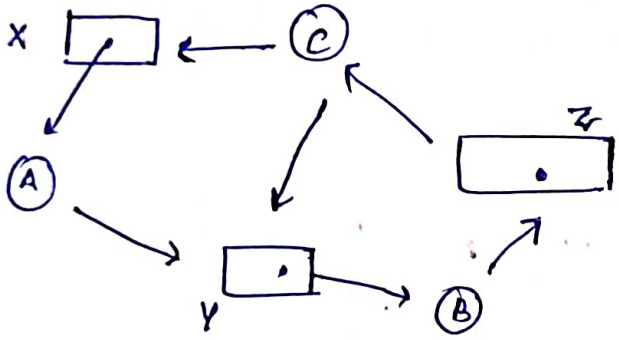
	X	Y	Z
A	1	0	0
B	0	1	0
C	0	0	1
→	1	1	1

Requesting matrix

	X	Y	Z
A	0	1	0
B	0	0	1
C	1	1	0

current availability = (1 1 1) - (1 1 1)

= 0 0 0



Since, current availability cant fulfil request of any of the process (A, B or C) we can say it is a DEADLOCK

3

	Allocation			Max need			Remaining need			Current Availability		
	A	B	C	A	B	C	A	B	C	A	B	C
P_0	4	0	0	6	0	1	2	0	1	3	2	1
P_1	1	1	0	2	7	5	1	6	5	7	2	1
P_2	1	2	5	2	3	5	1	1	0	8	4	6
P_3	0	6	3	1	6	5	1	0	2	9	6	7
P_4	1	2	1	2	6	5	1	4	4	10	7	7
	7	11	9									

Current availability = 3 2 1

P_0 3 2 1

$-$ 2 0 1 allocated (1)

1 2 0

6 0 1 released → 2 0 1

CA → 7 2 1 + 1 0 0

6 0 1

P_2 7 2 1

$-$ 1 1 0 allocated

(CA) → 6 1 1 (2)

$+$ 2 3 5 released → 1 1 0

1 2 5

CA 8 4 6 2 3 5

(P4)

```
   8   4   6
   1   4   4   → allocated
  ---------
   7   0   2
   2   6   5   released
  ---------
CA → 9   6   7
```

```
   1   2   1
   1   4   4
  ---------
   2   6   5
```

(P1)

```
   9   6   7
 - 1   6   5   allocated
  ---------
   8   0   2
 + 2   7   5   released
  ---------
CA → 10  7   7
```

```
   1   6   5
   1   1   0
  ---------
   2   7   5
```

(P3)

```
   8   4   6
   1   4   4   → allocated
  ---------
   7   0   2
   2   6   5   released
  ---------
CA → 9   6   7
```

```
   1   2   1
 + 1   4   4
  ---------
   2   6   5
```

A	B	C
10	13	10

verify

```
  10   13   10
- 7    1    9
  ---------
  3    12   1   = first current availability
```

Safe sequence = $[P_0 - P_2 - P_4 - P_1 - P_3]$

4) • Worst-fit

$P_1 = 212\ K$ ✓

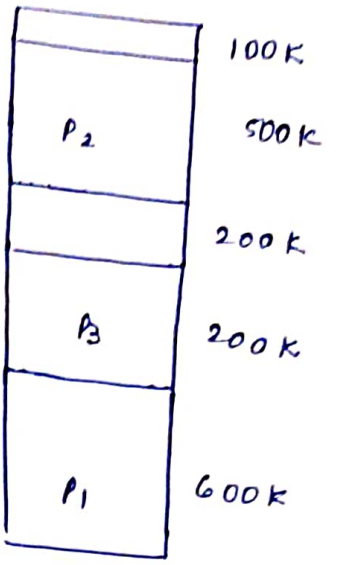
$P_2 = 417\ K$ ✓

$P_3 = 112\ K$ ✓

$P_4 = 426\ K$ ✗

↓

no space left.
must wait



- First-fit

$P_1 = 212\ K$ ✓

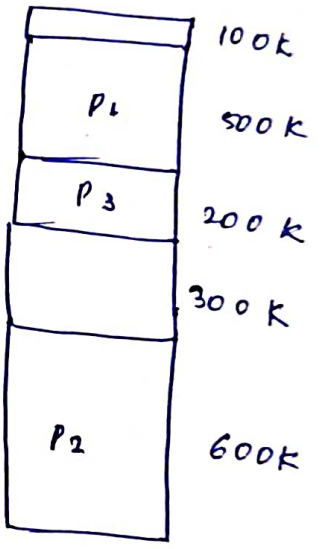
$P_2 = 417\ K$ ✓

$P_3 = 112\ K$ ✓

$P_4 = 426K$ ✗

↓

must wait
no space left



- Best-fit

$P_1 = 212\ K$ ✓

$P_2 = 417\ K$ ✓

$P_3 = 112\ K$ ✓

$P_4 = 426\ K$ ✓

↓

all P get allocated