

Assignment 02 :-

- 1 Consider a system that contains five processes P_1, P_2, P_3, P_4, P_5 & the three resources types A B & C. Following are the resources types; A has 10, B has 5 & the resources type C has 7 instances.

Ans	Process	Allocation			Max			Available		
		A	B	C	A	B	C	A	B	C
	P_1	0	1	0	7	5	3	3	3	2
	P_2	2	0	0	3	2	2			
	P_3	3	0	2	9	0	2			
	P_4	2		1	2	2	2			
	P_5	0	0	2	4	3	3			

Answer the following question using the banker's algorithm

- 1 Write the contents of the need matrix?
- Ans $\text{Need}[i] = \text{max}[i] - \text{Allocation}[i]$
- $$\begin{aligned} P_1 &= (7, 5, 3) - (0, 1, 0) = (7, 4, 3) \\ P_2 &= (3, 2, 2) - (2, 0, 0) = (1, 2, 2) \\ P_3 &= (9, 0, 2) - (3, 0, 2) = (6, 0, 0) \end{aligned}$$

2 Is the system in a safe state? If yes, then what is the safe sequence.

Ans Step 1:- For process P_1
 $Need \leq Available$
 $7,4,3 \leq 3,3,2$ condition is false.

Step 2:- For process P_2
 $Need \leq Available$
 $1,2,2 \leq 3,3,2$ condition is true

$$\text{New available} = \text{Available} + \text{Allocation}$$
$$(3,3,2) + (2,0,0) = 5,3,2$$

Step 3:- For process P_3
 $Need \leq Available$
 $6,0,0 \leq 5,3,2$ condition is false.

Step 4:- For process P_4
 $Need \leq Available$
 $0,1,1 \leq 5,3,2$ condition is true

$$\text{New Available} = \text{Available} + \text{Allocation}$$
$$5,3,2 + 2,1,1 = 7,4,3$$

Step 5:- For process P_5
 $Need \leq Available$
 $4,3,1 \leq 7,4,3$ condition is true

$$\text{New Available} = \text{Available} + \text{Allocation}$$
$$7,4,3 + 0,0,2 = 7,4,5$$

Step 6:- Process P_1
 $Need \leq Available$
 $7,4,3 \leq 7,4,5$ condition is true

$$\text{New Available} = \text{Available} + \text{Allocation}$$
$$7,4,5 + 0,1,0 = 7,5,5$$

Step 7:- For process P_3
 $Need \leq Available$
 $6,0,0 \leq 7,5,5$ condition is true

$$\text{New Available} = \text{Available} + \text{Allocation}$$
$$7,5,5 + 3,0,2 = 10,5,7$$

2 What will happen if the resource request $C_1,0,2$ for process P_2 can the system accept this request immediately?

Ans P_2 request = $(1, 0, 2)$

$$\begin{aligned} \text{Available} &= \text{Available} - \text{Request} \\ &= (3, 3, 2) - (1, 0, 2) \\ &= 2, 3, 0 \end{aligned}$$

$$\begin{aligned} \text{Available} &= \text{Available} + \text{Request} \\ &= (2, 0, 0) + (1, 0, 2) \\ &= 3, 0, 2 \end{aligned}$$

$$\begin{aligned} \text{Need} &= \text{Need} - \text{Request} \\ &= 1, 2, 2 - 1, 0, 2 \\ &= 0, 2, 2 \end{aligned}$$

Process	Allocation			Need			Available		
	A	B	C	A	B	C	A	B	C
P_1	0	1	0	7	4	3	2	3	0
P_2	3	0	2	0	2	0			
P_3	3	0	2	6	0	0			
P_4	2	1	1	0	1	1			
P_5	0	0	2	4	3	1			

Apply Bankers Algorithm :-

Step 1:- For process P_1 ,
 $\text{Need} \leq \text{Available}$
 $7, 4, 3 \leq 2, 3, 0$
 condition is false.

Step 2:- For process P_2
 $\text{Need} \leq \text{Available}$
 $0, 2, 0 \leq 2, 3, 0$
 condition is true.

$$\begin{aligned} \text{New Available} &= \text{Available} + \text{Allocation} \\ &= 2, 3, 0 + 3, 0, 2 \\ &= 5, 3, 2 \end{aligned}$$

Step 3 :- For process P_3
 $\text{Need} \leq \text{Available}$
 $6, 0, 0 \leq 5, 3, 2$
 condition is false

Step 4 :- For process P_4
 $\text{Need} \leq \text{Available}$
 $0, 1, 1 \leq 5, 3, 2$
 condition is true

$$\begin{aligned}\text{New Available} &= \text{Available} + \text{Allocation} \\ &= 5, 3, 2 + 2, 1, 1 \\ &= 7, 4, 3\end{aligned}$$

Step 5 :- for process P_5

$$\begin{aligned}\text{Need} &\leq \text{Available} \\ 4, 3, 1 &\leq 7, 4, 3 \text{ so} \\ \text{condition is true.}\end{aligned}$$

$$\begin{aligned}\text{New available} &= \text{Available} + \text{Allocation} \\ &= 7, 4, 3 + 0, 0, 2 \\ &= 7, 4, 5\end{aligned}$$

Step 6 :- For process P_1

$$\begin{aligned}\text{Need} &\leq \text{Available} \\ 7, 4, 3 &\leq 7, 4, 5 \text{ condition is true.}\end{aligned}$$

$$\begin{aligned}\text{New Available} &= \text{Available} + \text{Allocation} \\ &= 7, 4, 5 + 0, 1, 0 \\ &= 7, 5, 5\end{aligned}$$

Step 7 :- For process P_3
 $\text{Need} \leq \text{Available}$
 $6, 0, 0 \leq 7, 5, 5$ so
 condition is true.

$$\begin{aligned}\text{New Available} &= \text{Available} + \text{Allocation} \\ &= 7, 5, 5 + 3, 0, 2 \\ &= 10, 5, 7.\end{aligned}$$