

長庚大學107學年度第一學期 作業系統 第四次小考

系級:

姓名:

學號:

Banker's Algorithm is a deadlock avoidance algorithm. Assume there are 5 processes $\{P_0, P_1, P_2, P_3, P_4\}$ and three types of shared resources $\{A, B, C\}$ in the system, and the details are in the following table.

(1) By Banker's Algorithm, is the system in a safe state? If your answer is yes, please provide a safe sequence. If your answer is no, please provide the reason.

(2) Now, P_0 further has a request $(1, 1, 0)$ to use 1 more instance of A and 1 more instance of B. Should the request be granted? Again, provide the reason to support your answer.

(3) If we reject the request in (2), Now, P_3 further has a request $(0, 1, 1)$ to use 1 more instance of B and 1 more instance of C. Should the request be granted? Again, provide the reason to support your answer.

	Allocation			Max			Need			Available		
	A	B	C	A	B	C	A	B	C	A	B	C
P0	0	1	0	7	5	3	7	4	3	3	3	2
P1	1	0	1	2	4	3	1	4	2			
P2	3	0	2	9	0	2	6	0	0			
P3	0	1	1	0	2	2	0	1	1			
P4	2	1	1	6	4	2	4	3	1			

Answer:

(1) Yes.

Run the Banker's Algorithm: Available(3, 3, 2) \rightarrow P3 Need(0, 1, 1) \rightarrow Available(3, 4, 3) \rightarrow P1 Need(1, 4, 2) \rightarrow Available(4, 4, 4) \rightarrow P4 Need(4, 3, 1) \rightarrow Available(6, 5, 5) \rightarrow P2 Need(6, 0, 0) \rightarrow Available(9, 5, 7) \rightarrow P0 Need(7, 4, 3)

(2) No.

Check 1: $(1, 1, 0) \leq P_0 \text{ Need}(7, 4, 3)$

Check 2: $(1, 1, 0) \leq$ the current Available (3, 3, 2)

Check 3: Try to give the requested resources and run Banker's Algorithm

After the system grants the request: Available(3, 3, 2) \rightarrow Available(2, 2, 2). P0 has Need(6, 3, 3) and Allocation(1, 2, 0).

We then run the Banker's Algorithm again: Available(2, 2, 2) \rightarrow P3 Need(0, 1, 1) \rightarrow Available(2, 3, 3) \rightarrow No one can run now!

(3) Yes.

Check 1: $(0, 1, 1) \leq P_3 \text{ Need}(0, 1, 1)$

Check 2: $(0, 1, 1) \leq$ the current Available (3, 3, 2)

Check 3: Try to give the requested resources and run Banker's Algorithm

After the system grants the request: Available(3, 3, 2) \rightarrow Available(3, 2, 1). P3 has Need(0, 1, 1) and Allocation(0, 2, 2).

We then run the Banker's Algorithm again: Available(3, 2, 1) \rightarrow P3 Need(0, 0, 0) \rightarrow Available(3, 4, 3) \rightarrow P1 Need(1, 4, 2) \rightarrow Available(4, 4, 4) \rightarrow P4 Need(4, 3, 1) \rightarrow Available(6, 5, 5) \rightarrow P2 Need(6, 0, 0) \rightarrow Available(9, 5, 7) \rightarrow P0 Need(7, 4, 3)