**5 Consider the following snapshot of a system:**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **process** | **Max need** | | | **Current allocation** | | | **Current requesting** | | | | **Available** | | |
| **R1** | **R2** | **R3** | **R1** | **R2** | **R3** | **R1** | **R2** | **R3** | **R1** | | **R2** | **R3** |
| **P1** | **2** | **1** | **1** | **0** | **1** | **0** | **0** | **0** | **0** | **0** | | **0** | **0** |
| **P2** | **4** | **0** | **2** | **2** | **0** | **0** | **2** | **0** | **2** |
| **P3** | **3** | **1** | **4** | **3** | **0** | **3** | **0** | **0** | **1** |
| **P4** | **4** | **1** | **2** | **2** | **1** | **1** | **1** | **0** | **0** |
| **P5** | **1** | **1** | **4** | **0** | **0** | **2** | **0** | **0** | **2** |

**Answer the following questions using the banker’s algorithm:**

1. **What is the content of the matrix need?**
2. **Is the system in a safe state? Why?**
3. **If the five processes request more resources (given in the above table) simultaneously, is the system deadlocked?**

**参考答案：**

**a．系统不处于安全状态，因为：need 矩阵**

|  |  |  |  |
| --- | --- | --- | --- |
|  | **R1** | **R2** | **R3** |
| **P1** | **2** | **0** | **1** |
| **P2** | **2** | **0** | **2** |
| **P3** | **0** | **1** | **1** |
| **P4** | **2** | **0** | **1** |
| **P5** | **1** | **1** | **2** |

**b.由于系统可用资源available=(0,0,0),不能满足任何一个进程的需求，故不存在安全序列，所以系统处于不安全状态。**

**c. 根据死锁检测算法，可知系统中存在死锁。**

**Work=available=（0，0，0）finish[i]=false for i=1，2，3，4，5**

**由于request1=（0，0，0）<= available，所以 finish[1]=true，work=（0，1，0）**

**For i=2,3,4,5, request1>work, 所以 finish[i]=false for i=2，3，4，5**

**因此，进程P2、P3、P4、P5处于死锁状态，**

**所以系统中存在死锁。**