一、

1. 此时系统的可用资源数量Available为[3,0,5,1,1].

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| 进程名 | Work | Allocation | Need | W+A | Finish |
| P0 | [3,0,5,1,1] | [0,2,1,1,1] | [1,0,2,1,1] | [3,2,6,2,2] | TRUE |
| P3 | [3,2,6,2,2] | [0,3,1,2,0] | [1,0,1,2,1] | [3,5,7,4,2] | TRUE |
| P1 | [3,5,7,4,2] | [2,0,1,1,1] | [0,3,2,1,0] | [5,5,8,5,3] | TRUE |
| P2 | [5,5,8,5,3] | [0,1,0,1,1] | [0,3,3,2,2] | [5,6,8,6,4] | TRUE |

1. 安全，存在安全序列P0->P3->P1->P2

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| 进程名 | Work | Allocation | Need | W+A | Finish |
| P0 | [3,0,5,1,1] | [0,2,1,1,1] | [1,0,0,0,1] | [3,2,6,2,2] | TRUE |
| P3 | [3,2,6,2,2] | [0,3,1,2,0] | [1,0,1,2,1] | [3,5,7,4,2] | TRUE |
| P1 | [3,5,7,4,2] | [2,0,1,1,1] | [0,3,2,1,0] | [5,5,8,5,3] | TRUE |
| P2 | [5,5,8,5,3] | [0,1,0,1,1] | [0,3,3,2,2] | [5,6,8,6,4] | TRUE |

1. 安全，存在安全序列P0->P3->P1->P2

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 进程名 | 分配前Available | 分配后Available | 释放资源 | 释放后Available |
| P0 | [3,0,5,1,1] | [2,0,3,0,0] | [1,2,3,2,2] | [3,2,6,2,2] |
| P3 | [3,2,6,2,2] | [2,2,5,0,1] | [1,3,2,4,1] | [3,5,7,4,2] |
| P1 | [3,5,7,4,2] | [2,5,5,3,1] | [3,0,3,2,3] | [5,5,8,5,3] |
| P2 | [5,5,8,5,3] | [5,2,5,3,1] | [0,4,2,3,3] | [5,6,8,6,4] |

4.p0申请[1,0,2,1,1]剩余资源满足，p0执行完代码后会释放资源

二、选择题

2.竞争不可抢占性资源、竞争可消耗性资源、进程推进顺序不当

3.不发生死锁的条件是至少能保证─个进程能获得三台打印机资源。

最坏的情况是1个进程获取三台打印机资源，另外N-1个进程获取到两台打印机，等待获取第三台。

3+(N-1)\*2=13

N=5

5.可以通过破坏死锁的四个必要条件来预防死锁。可以破坏不可剥夺条件，规定进程在提出新的资源请求而不能立即满足时，必须释放已经保持的所有资源;破坏部分分配条件，规定所有进程在开始运行之前，必须一次性的申请到所需的全部资源，否则，一个也不分配;破坏循环等待条件，规定将系统中所有的资源进行编号，进程在申请资源时必须严格按照资源序号递增的次序，这样就不可能出向环流。而互斥条件是由设备的固有条件所决定的，不仅不能改变，还应加以保证。