**Introduction to Operating Systems**

**COP 4600-001**

Name and ID \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Worksheet # 9**

Q1. Draw the wait-for graph for the following situation:

P1 is using R1 and waiting for R2

P2 is using R2 and waiting for R4

P3 is using R5 and R3 and is waiting for R1

P4 is using R4 and is waiting for R5

1. Is there deadlock in this system?
2. If the answer is YES , then which processes are deadlocked

Q2 A system has: 5 processes *P*0 through *P*4; and 3 resource types: *A* (9 instances), *B* (5 instances), and *C* (7 instances). At a time T0 the state of the system is as shown below

***Allocation Max Available***

***A B C A B C A B C***

***P*0 1 1 0 6 5 3 2 3 1**

***P*1 1 0 2 3 2 2**

***P*2 2 0 1 8 0 2**

***P*3 2 1 1 3 2 2**

***P*4 1 0 2 4 2 3**

1. Is the system is in a safe state?

1. Can request for (2,2,1) by *P*4 be granted? If YES find the safe state. If NO explain why NOT
2. Can request for (0,2,0) by *P*0 be granted? If YES find the safe state. If NO explain why NOT
3. Can request for (1,0,1) by *P*2 be granted? If YES find the safe. If NO explain why NOT