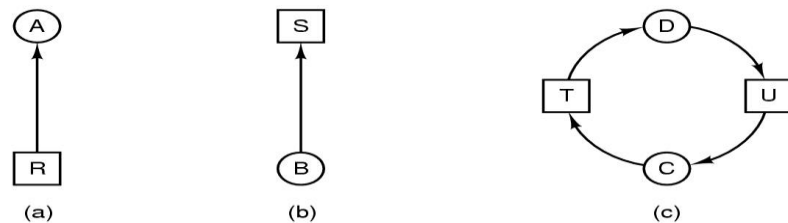# The University of Lahore

CS-11303 Operating Systems
Assignment 3

Due Date: Monday 26 December 2022

NOTE: Only handwritten assignment will be accepted and marked.
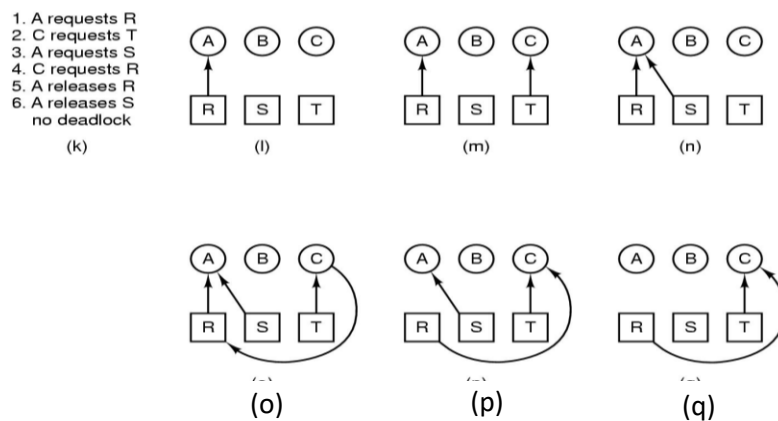
Question 1

The diagram below shows the concept of resource graph.

Do illegal graphs exist, that is graph that structurally violate the model we have used of resource usage? If so, give an example of one.

Question 2

Look at the diagram below.

Suppose that in step (o) C requested S instead of requesting R. Would this lead to deadlock? Suppose that it is requested both S and R.

Question 3
Apply deadlock detection algorithm with multiple resources of each type to the following data and show the results, under what circumstances the deadlock may occur and may not occur?
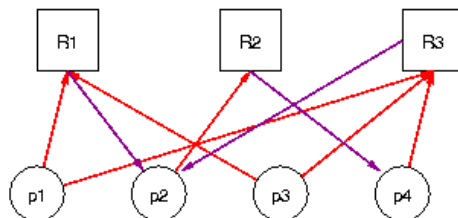
$$\text{Available} = (2 \quad 1 \quad 0 \quad 0)$$

Request   **Allocation**

$$\begin{Bmatrix} 2 & 0 & 0 & 1 \\ 1 & 0 & 1 & 0 \\ 2 & 1 & 0 & 0 \end{Bmatrix} \qquad \begin{Bmatrix} 0 & 0 & 1 & 0 \\ 2 & 0 & 0 & 1 \\ 0 & 1 & 2 & 0 \end{Bmatrix}$$

Question 4
The picture below shows the resource graph.

a)   Show the state of which resource is currently holds and which ones are currently being requested by the processes. Also mention which process terminates and which one waits for the resource?

b)   Apply the deadlock detection algorithm to decide, is this system is deadlocked, and if so, which processes are involved?

Question 5
Take a careful look at the picture (b) below. If D asks for one more units, does this lead to a safe state or an unsafe one? What if the request came from C instead of D?

	Has	Max
A	0	6
B	0	5
C	0	4
D	0	7

Free: 10
(a)

	Has	Max
A	1	6
B	1	5
C	2	4
D	4	7

Free: 2
(b)

	Has	Max
A	1	6
B	2	5
C	2	4
D	4	7

Free: 1
(c)

Question 6
A system has four processes and five allocatable resources. The current allocation and maximum needs are as follows.

	Allocated	Maximum	Available
Process A	10211	11212	00x11
Process B	20110	22210	
Process C	11010	21310	
Process D	11110	11221	

What is the smallest value of x for which this is a safe state?

…………………………….... **End of Assignment**…………………………………