LEHMAN COLLEGE
OF THE
CITY UNIVERSITY OF NEW YORK
Department of Computer Science

CMP 426/CMP 697 Exam 2

Date: April 12, 2019

Name: _____

Instructions:

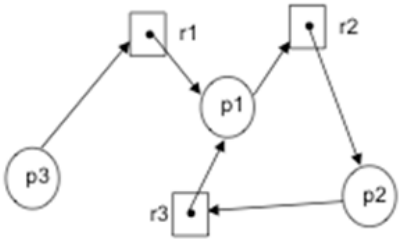
- Answer all the questions on this paper.
- Please make sure your answers are legible.
- Please read each question very carefully and answer the question clearly to the point.
- This is a CLOSED book exam!

1. **(42 points) Deadlocks**
   A). (4 points) What are the four conditions required for a deadlock to occur?

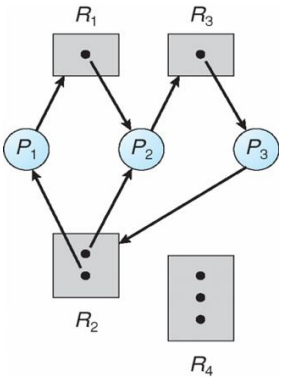
   B). (4 points) Assuming the operating system detects the system is deadlocked, what can the operating system do to recover from deadlock?

B) (8 points) Resource allocation graphs.

a) State if the following resource allocation graph is deadlocked.



b) State if the following resource allocation graph is deadlocked.



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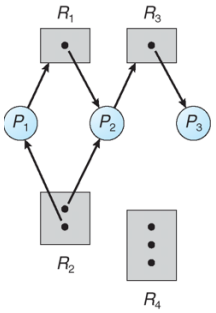

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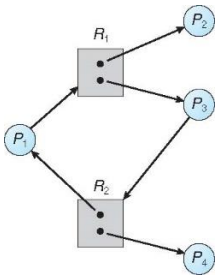

Consider the following system with five processes (P0, P1, P2, P3, and P4) and resource types A, B, and C.

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

C) (4 points) Determine the contents in the Need matrix.

D) (10 points) Determine whether the above system is safe or unsafe. If the system is in a safe state, provide the safe sequence. If the system is in an unsafe state, illustrate why the system is unsafe. Show your work.

E) If a request from process 1 arrives for (1, 0, 2) can the request be granted immediately (12 points). Show your work.

2) (40 Points) CPU Scheduling.

A). (8 points) What is the difference between preemptive scheduling and non-preemptive scheduling? What is the issue with the latter?

B). (9 points) Describe round robin scheduling. What is the parameter associated with the scheduler? What is the issue in choosing the parameter?

Given the following information:

Process	Burst Time	Priority
P0	2	2
P1	1	1
P2	8	4
P3	4	2
P4	5	3

Use the above table to answer Question A) and B)

A). (12 points) Draw four Gantt charts that illustrate the execution of these processes using First-Come First-Served (FCFS), Shortest Job First (SJF), Round Robin (using a time quantum of 2), nonpreemptive priority scheduler (The smaller priority implies a higher priority)

B). (11 points) What is the waiting time and average waiting time for each process for the scheduling algorithms from the above question.

3) (38 points) Memory Management

A). (6 points) What is swapping and when is it used?

B). (10 pts) List three algorithms for managing memory with contiguous memory allocation. Do these algorithms require compaction to work? Why or why not?

C). (6 points) What is fragmentation? What is the difference between external and internal fragmentation?

D). (6 pts) Explain the difference between logical and physical addresses.

E). Consider the following segment table

Segment	Base	Length
0	219	600
1	2300	14
2	90	100
3	1327	580
4	1952	96

(10 points) What are the physical addresses for the following logical addresses?

a. 0,430

b. 1,10

c. 2,500

d. 3,400

e. 4,112