COMSATS University Islamabad, Lahore Campus

Final Examination – Spring 2024

Course Title:	Operating Systems		Course Code:	CSC 323	Credit Hours: 3(2,1)
Course	Mr. M Mudassar		Program Name:	BSCS, BSSE, BSEE, BSCE	
Semester:	[redacted]	Batch: [redacted] Section: [redacted]		Date:	11/06/2024
Time Allowed:	**180 Minutes**		**Maximum Marks:**		**50**
Student's Name:	[redacted]		Reg. No.	[redacted]	

Important Instructions / Guidelines:

- Write to the point and avoid unnecessary details.

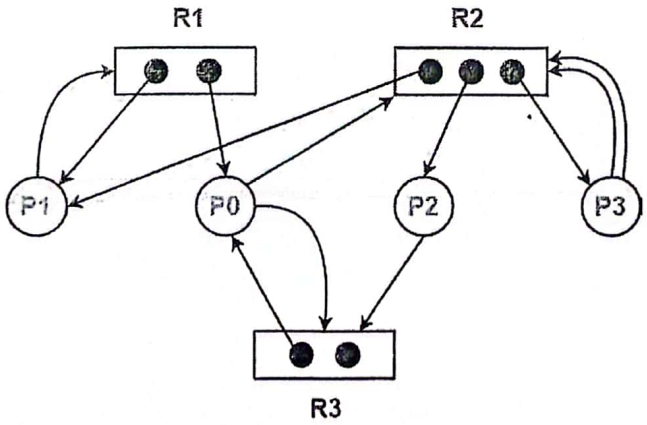
Question No 1: CLO: <1>: Bloom Taxonomy Level: <Understanding> **[4 + 3 = 7]**

a. Suppose there are four processes (A, B, C, and D) in which process A takes 5 units, B takes 3 units, C takes 2 units, and D takes 6 units of time for execution. Only process D starts its execution at zero unit of time, process B starts at 3 units of time, process C must start its execution exactly one unit before the completion of process D's execution, and process A must start its execution after one unit of time of process B's execution. First, illustrate the processes execution sequence (using line graph) with respect to the given execution time. Second, is there any time frame in which all the processes are executed concurrently? If yes, then mention that time frame, otherwise justify your answer in your own words?

b. Explain the role of I/O kernel subsystems in operating systems.

Question No 2: CLO: <2>: Bloom Taxonomy Level: <Analyzing> **[3 + 5 = 8]**

a. Consider the given resource allocation graph and justify whether the given system of processes is deadlock free or not? Provide how the processes get resources and executed.



b. Suppose there is a system of five processes (P0, P1, P2, P3, and P4), four resources (A, B, C, and D), and the number of instances allocation, max, and available are given in below table. Is the system in a safe state? If yes provide the safe sequence of processes, otherwise justify your answer in your own words.

Do your own work, some One is watching!

Best of Luck

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

Question No 3: CLO: <3>: Bloom Taxonomy Level: <Analyzing> [5 + 6 + 10 + 6 + 3 = 30]

a. Consider the segment table for process P1. The segment table contains the following entries:

P1

Segment	Base	Length
0	450	350
1	1240	250
2	70	400
3	1400	270
4	180	700

Determine the physical addresses for the following logical addresses along with segment number of P1 (segment number, logical address):

i. (0, 410) **ii.** (1, 1300) **iii.** (2, 40) **iv.** (3, 1200) **v.** (4, 280)

b. Suppose there are six memory partitions of fixed sizes as 400KB, 650KB, 350KB, 210KB, 600KB, 120KB, and six processes that require memory as 130KB, 80KB, 200KB, 380KB, 230KB, and 450KB (in order). Allocate the memory to each process from the given memory partitions applying First Fit, Best Fit, and Worst Fit memory allocation strategies. Also describe if there any common memory partition(s) which is(are) not allocated to any process in the said strategies.

c. Consider the following string of page references and apply the Optimal and Least Recently Used (LRU) page replacement algorithms to calculate the page fault. Imagine you have four frames.

5	4	0	10	4	7	5	4	9	4	8	2	6	0	5	2	6	8	4	2

d. Consider a memory partition of size 2500KB in which first 0KB to 300KB memory is allocated to Operating System. Rest, there are 6 processes requiring memory size of 750KB, 670KB, 400KB, 700KB, 250KB, and 600KB and the execution time of each process is as 9, 7, 3, 2, 6, 5 in order. Apply the suitable memory allocation scheme to allocate memory to each process. Make sure to apply compaction and coalescing wherever required (Note: you are supposed to choose the most efficient possibility).

e. Suppose there are three processes (P1, P2, and P3). P1 requires 25 pages, P2 requires 55 pages, and P3 requires 50 pages. The free frames available are 60. Calculate the number of frames (applying allocation algorithm) that are required for each process to start its execution.

Question No 4: CLO: <4>: Bloom Taxonomy Level: <Understanding> [5]

Explain Index-Node of the UNIX file system with the help of a suitable diagram along its various types of memory access.

Do your own work, some One is watching!

Best of Luck