



COMSATS University Islamabad, Lahore Campus

(Defence Road, Off Raiwind Road, Lahore)

☐ Midterm Exam ☒ Terminal Exam – Fall 2022

Course Title:	Operating Systems		Course Code:	CSC-322	Credit Hours:	3(2,1)
Course Instructor/s:	M Mudassar		Programme Name:	BCS		
Semester:	Batch:	Section:	G-1, G-6	Date:	Jan 25, 2022	
Time Allowed:	180 Minutes		Maximum Marks:			50
Student's Name:			Reg. No.			
Important Instructions / Guidelines:						
<ul style="list-style-type: none">Read the question statement, note, and marks distribution carefully.						

Question-01:

[Marks: 2]

CLO:1; Bloom Taxonomy Level: Understanding

Explain the difference between maskable and non-maskable interrupts in operating system?

Question-02:

[Marks: 6]

CLO:2; Bloom Taxonomy Level: Analyzing

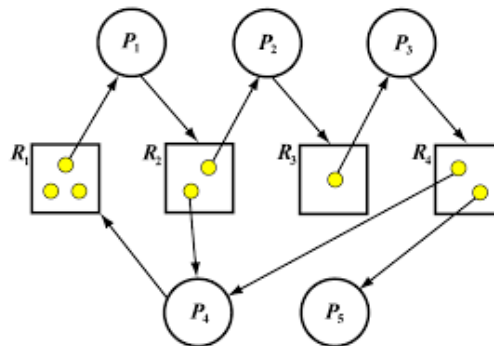
Consider there are five processes P1, P2, P3, P4, P5 having burst time (in milliseconds) 12, 17, 9, 20, 13 respectively, and time quantum of 5 milliseconds. Draw the Gantt chart of CPU allocation to each process by applying the Round Robin CPU scheduling scheme. Also calculate the average wait time, average turnaround time, and throughput.

Question-03:

[Marks: 2 + 1 = 3]

CLO:3; Bloom Taxonomy Level: Analyzing

Consider the below Resource Allocation Graph (RAG):



- Draw the respective wait-for graph.
- Explain, is the given system (RAG) is deadlock free or not?

Question-04:**[Marks: 4 + 2 = 6]***CLO:2; Bloom Taxonomy Level: Analyzing*

- a. Consider the below record structure and illustrate that how the semaphore operations can be defined on it?

```

type S = record
    value = integer
    Queue = List of processes
end

```

- b. Understand the given three processes (P1, P2, and P3, along with semaphore variables V=0, W=0, X=0, Y=0, and Z=0). Justify which process will execute first and does each process execute successfully?

Process	Code Statement(s)
P1	Start statement-1; Wait(Y); statement-2; Signal(Y); statement-3; Wait(Z); statement-4; Signal(X); statement-5; Signal(Z); statement-6; End
P2	Start statement-1; statement-2; Wait(V); statement-3; Wait(W); statement-4; Signal(V); statement-5; Signal(W) End
P3	Start Wait(X); statement-1; Wait(Z); statement-2; Signal(Z); statement-3; End

Question-05:**[Marks: 5]***CLO:2; Bloom Taxonomy Level: Analyzing*

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 being in a safe state? If yes find out the safe sequence of processes, otherwise justify your answer in your own words.

	Allocation				Max				Available			
	A	B	C	D	A	B	C	D	A	B	C	D
P0	0	0	1	2	0	0	1	2	1	5	2	0
P1	1	0	0	0	1	7	5	0				
P2	1	3	5	4	2	3	5	6				
P3	0	6	3	2	0	6	5	2				
P4	0	0	1	4	0	6	5	6				

Question-06:**[Marks: 7 + 5 = 12]***CLO: 3; Bloom Taxonomy Level: Analyzing*

- a. Suppose we have five memory partitions of fixed sizes as 300KB, 600KB, 450KB, 290KB, 357KB and five processes that requires memory as 310KB, 250KB, 150KB, 400KB, and 320KB (in order). Allocate the memory to the processes from given memory partitions applying First Fit and Worst Fit memory allocation schemes. Also tell that is there any memory partition(s) which is not allocated to any process in both strategies?

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

P1	Segment	Base	Length/Limit
	0	315	600
	1	2400	390
	2	1275	250
	3	80	130
	4	1970	400

Determine the physical addresses for the following logical addresses of P1.

- i. (0, 480) ii. (1, 490) iii. (2, 200) iv. (3, 150) v. (4, 300)

Question-07:

[Marks: 8 + 3 = 11]

CLO:3; Bloom Taxonomy Level: Analyzing

- Suppose we have 15 pages (2, 3, 5, 4, 3, 7, 4, 6, 2, 4, 7, 2, 3, 5, 1) and three frames. Apply the Least Recently Used (LRU) Page Replacement Algorithm to assign the frames to each page and calculate the ratio of page hit and page fault.
- Suppose there are three processes (P1, P2, and P3) and 80 free frames. P1 requires 15 pages, P2 requires 32 pages, and P3 requires 45 pages to perform a particular job. How many frames are required for each process to start their execution?

Question-08:

[Marks: 5]

CLO: 4; Bloom Taxonomy Level: Understanding

What is Index Node (I-Node) of a UNIX file system? Also explain its types of blocked address.

Best of luck!