Unique Paper Code: 42344304
Name of the Course: B.Sc. Physical Science/Mathematical Science
Name of the Paper: Operating Systems
Semester: III
Duration: 3 Hours
Maximum Marks: 75
Instructions for Candidates: Attempt any four out of six questions. All questions carry equal marks.

Q1) What do you understand by "Convoy Effect" with respect to CPU Scheduling?
Describe dual-mode operation of an Operating System.
Explain the layered approach of Operating System structure. What are the advantages and disadvantages of layered approach to system design?

Q2) Consider the following set of processes, with the length of CPU bursts given in milliseconds:

Process	**Priority**	**Burst Time**
P1	2	10
P2	3	5
P3	1	4
P4	2	3

- Draw Gantt Charts illustrating the execution of these processes using FCFS and Priority Scheduling.
- Also calculate average Turnaround Time and Average Waiting Time for above schemes.

What do you understand by "degree of multiprogramming"? Which scheduler controls degree of multiprogramming? Why?

Q3) Enumerate major activities of an Operating System with regard to "Process Management".
What are the differences between user threads and kernel level threads? How does Cache help to improve system performance? What problems do they cause?
Find EAT given that Hit ratio is 80% and it takes 20 nanoseconds to search TLB and 100 nanoseconds for accessing main memory.

Q4) Consider a logic address space of 64 pages with 1024 words per page, mapped onto a physical memory of 32 frames:
How many bits are required in the Logical Address?

How many bits are required in the Physical Address?
Give any 3 reasons for a parent process to terminate execution of it's child processes?
What do you understand by load time, compile time and execution time binding?
Explain 5 challenges in programming for multicore systems.

Q5) What are some of the commands to compare files in Unix Operating System?
Write Shell Script to find factorial of a given number.
Also write commands that perform the following actions:

- To count number of occurrences of the word "vaccine" in a file named "pandemic.doc"
- To count number of files in current working directory
- Give permission to a file such that only the owner has execute permissions
- Count the number of users currently logged in the system.
- To sort the file alphabetically

Q6) If memory partitions are of 500 KB, 300 KB, 100 KB, 200 KB and 600 KB (in order). How would each of the first fit, best fit and worst fit algorithms place the processes of 250 KB, 350 KB, 100 KB and 426 KB (in order)? Which algorithm makes the most efficient use of memory? Also differentiate between external and internal fragmentation.