Assignment 1
Operating System (BCAC0022)
BCA 2nd Year

1. Enumerate the basic functions of the operating system and explain each in brief.
2. Write short notes on the following:
   (i) Time Sharing System; ii) Real-Time System.
3. List five services provided by an Operating System. Explain how each of them provides convenience to the users. Explain in which cases it would be impossible for user-level programs to provide these services.
4. Draw the state diagram of a process and label various transitions. Explain the need for process suspension.
5. What is a process control block? Explain all its components.
6. Explain the short-term, medium-term, and long-term scheduling. Describe the differences among them.
7. Define the difference between preemptive and non-preemptive scheduling. State why strict non-preemptive scheduling is unlikely to be used in a computer center.
8. Give the principles, which should be followed by any solution designed to achieve mutual exclusion in critical section problems.
9. A company faces resource allocation issues among multiple running applications, leading to performance degradation. Which operating system function would manage resources efficiently, and how can it be optimized to avoid such issues?
10. A developer is creating a multi-threaded application that needs to perform several tasks concurrently. How does the operating system support multithreading, and what mechanisms does it provide to handle synchronization and communication between threads?
11. A company is developing a custom operating system and must decide on its structure. Compare monolithic and microkernel structures, and recommend the best approach for the company's needs.

12. You are designing an operating system for a real-time embedded system used in an industrial control environment. The system must meet

strict timing constraints. What scheduling algorithm would you choose for this scenario? Justify your choice by discussing how different scheduling algorithms (e.g., Round robin, priority Scheduling, Rate-Monotonic) would perform in this environment.

13.   Write the advantages and disadvantages of each CPU Scheduling algorithm.

14.   Consider the longest remaining time first (LRTF) scheduling algorithm. In LRTF, ties are broken by giving priority to the process with the lowest process id. Calculate the average waiting time and average turn-around time.

Process	Burst Time	Arrival time
P1	4	0
P2	2	1
P3	5	2

15. Find the average waiting time and average turnaround time using:

a) FCFS;

b) SJF (NP);

c) SJF (P);

d) RR (TQ = 3).

Process	Burst Time	Arrival Time
P1	2	2
P2	6	5
P3	4	0

PROCESS	BURST TIME	ARRIVAL TIME
P4	7	0
P5	4	7

16. Find the average waiting time and average turnaround time using:
   a) SJF(NP)
   b) SJF(P)

PROCESS	BURST TIME	ARRIVAL TIME
P1	3	2
P2	5	0
P3	3	1
P4	4	6

17. Find the average waiting time and av. turnaround time using:
   a) priority (NP)
   b) priority (P).

18. Consider that processes with a lower priority number have a higher priority.

PROCESS	BURST TIME	ARRIVAL TIME	Priority
P1	3	2	1
P2	5	0	3
P3	3	1	2

P4	4	6	1

19. Consider three CPU-intensive processes, which require 10, 20 and 30 time units and arrive at times 0, 2 and 6, respectively. How many context switches are needed if the operating system implements a shortest remaining time first scheduling algorithm? Do not count the context switches at time zero and at the end.