Unique Paper Code: 42344304

Name of the Course: B.Sc. Physical Science/Mathematical Science

Name of Paper: Operating Systems

Semester: III

Duration: 3 Hours

Maximum Marks: 75

Year of Admission: Old Course

Attempt any four out of six questions. All questions carry equal marks.

Q1. **Justify** the statement that "*Operating System can be viewed as a resource allocator and a control program*". Considering the importance of an operating system, shall we protect it by placing it in a memory partition that could not be modified by either the user process or the operating system itself? Support your answer with reasons. What is a **kernel**? Explain how it can be protected?

Q2. Consider the following set of processes, with the length of the CPU burst times given in milliseconds

Process	Arrival Time	Burst Time
P1	0	7
P2	2	4
P3	4	2
P4	8	1

Draw **Gantt Charts** and Calculate **average waiting time, average turnaround time and average response time** for **FCFS**, **SJF**, **Shortest Remaining Time First** and **Round Robin** (Quantum = 4ms) scheduling algorithms. Which algorithm gives **minimum average waiting time**?

Q3. Differentiate between **multiprogramming and multiprocessing systems**. Suppose a company using a multiprogramming operating system, has **1 megabyte** of main memory out of which 720 kilobytes is reserved for user processes. Which **memory management technique** could be used to run a program greater than 720 kilobytes and why? Briefly explain the difficulties that may arise during the implementation? Describe the **hardware support** needed for the same.

Q4.   Explain briefly paging memory management scheme. Consider user program (executing under paging memory) of logical address of size 6 pages and page size is 4 bytes. The physical address contains 300 frames. The user program consists of 22 instructions a, b, c, . . . u, v. Each instruction takes 1 byte. Assume at that time the free frames are 7, 26, 52, 20, 55, 6, 18, 21, 70, and 90. Find the following?

- Draw the logical and physical maps and page tables?
- Allocate each page in the corresponding frame?
- Find the physical addresses for the instructions m, d, v, r?
- Calculate the fragmentation if exist?

Q5. What is a shell? Write a Shell Script to find the largest among the 3 given numbers using 'nested if' commands. Write the commands that does the following actions:

- to know the shell that is running on your system.
- to get a one-line manual page descriptions.
- to print second, fifth and seventh character from each line of the file F1
- to print only duplicate lines in a file F1.
- to convert from lower case to upper case

Q6.   Explain the following:
- Virtual address space
- Address binding
- Translation look aside buffers
- Dynamic Loading

Consider six memory partitions of size 200 KB, 400 KB, 600 KB, 500 KB, 300 KB and 250 KB. These partitions need to be allocated to four processes of sizes 357 KB, 210 KB, 468 KB and 491 KB in that order. Perform the allocation of processes using First Fit, Best Fit and Worst Fit Algorithm.