

**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: 2019**

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

Q1. What are the various difficulties that a user can face while interacting with a computer system, which is without an operating system? Differentiate between the two types of user interfaces provided by the operating system. What are the advantages of dual mode operations of operating system? Explain the problems that may arise due to the lack of a hardware-support of dual mode in an operating system.

Q2. Consider a set of 5 processes, with the length of the CPU-burst time given in milliseconds. The processes are assumed to have arrived in the order P1, P2, P3, P4, P5, all at time 0.

Process	Burst Time	Priority
P1	5	2
P2	13	3
P3	8	1
P4	4	5
P5	10	1

- Explain the life cycle experienced by process P3 in terms of process states.
- Briefly explain the various schedulers the process P3 would encounter at each stage.
- Draw four Gantt charts illustrating the execution of the above processes using FCFS, SJF, a non-preemptive priority (a smaller priority number implies a higher priority), and RR (quantum = 1) scheduling.
- What is the turnaround time waiting time and average waiting time of each process for each of the scheduling algorithms in part a?

Q3. What are system calls? Why would an application programmer prefer programming according to a library API rather than invoking actual system calls? Explain briefly how operating system handles a system call. What are the general methods used to pass parameters to the operating system?

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.