

**Cluster Innovation Centre
University of Delhi
End Semester Examination May 2023**

Name of the Course: B. Tech. IT & Mathematical Innovation
Semester: IV
Paper Title: Instructing computing devices: Operating System
Paper code: 32861402
Maximum marks: 50

Time duration: 2 Hours

Instructions:

1. This question paper contains 2 printed pages.
2. Attempt any five questions.

1.
 - a) Briefly explain the CPU switch or context switch from process to process.
 - b) What are the two models of interprocess communication?
 - c) Describe three general methods for passing parameters to the operating system.
 - d) List down the multithreading models.
 - e) Which of the scheduling algorithms could result in starvation? [2x5=10]

2. Consider the following set of processes with the length of the CPU burst time given in milliseconds:

Process	Burst time
P1	11
P2	19
P3	3
P4	17
P5	12

Assume that all processes arrive at time 0 in the order given. Draw three Gantt Charts illustrating the execution of these processes using: FCFS, SJF, and RR (Quantum=10 milliseconds) scheduling algorithms. Determine the average waiting time through each algorithm.

[10]

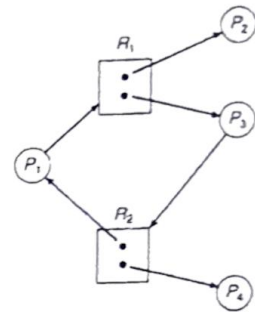
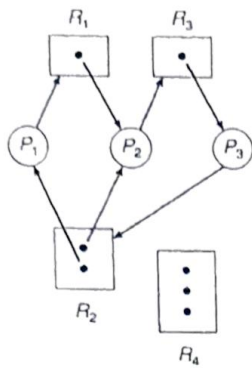
3. Consider the following snapshot of a system with four processes P0, P1, P2, P3 and four resources A, B, C and D

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

Using Banker's algorithm, answer the following questions: How many instances of resources A, B, C, D are there? What is the content of the Need matrix? Is the system in a safe state? If it is, find the safe sequence.

[10]

4. Briefly describe the necessary conditions to hold a deadlock situation. Give the deadlock and non-deadlock state from the following resource allocation graphs. Write all the request edge and assignment edge sets.



[10]

5. Write a multithreaded Java or Pthreads or Win32 program that outputs prime numbers. This program should work as follows: The user will run the program and will enter a number on the command line. The program will then create a separate thread that outputs all the prime numbers less than or equal to the number entered by the user.

[10]

6. Show that, if the wait() and signal() semaphore operations are not executed atomically, then mutual exclusion may be violated with the help of suitable case examples.

[10]