December 2023

B.Tech (ENC) 5th Semester

Operating System(PCC-CS-403)

Time: 3 Hours   Max. Marks:75

Instructions: 1. *It is compulsory to answer all the questions (1.5 marks each) of Part -A in short.*

2. *Answer any four questions from Part -B in detail.*

3. *Different sub-parts of a question are to be attempted adjacent to each other.*

4. *Any other specific instructions*

PART –A

Q1 (a) Define Multitasking, Multiprogramming and Multiprocessing.   (1.5)

(b) What is a race condition?   (1.5)

(c) What is the difference between internal and external fragmentation?   (1.5)

(d) What is virtual memory?   (1.5)

(e) What is the difference between Program and Process?   (1.5)

(f) What is the difference between non-preemptive and preemptive scheduling? (1.5)

(g) How will you prevent circular wait condition in deadlock?   (1.5)

(h) What is a counting semaphore? Explain with one example.   (1.5)

(i) Differentiate between Consumable and Non-Consumable resources?   (1.5)

(j) A process is to be swapped-in at the location 20100 in memory. If logical   (1.5)
     addresses generated by the process are 200,345,440 and 550, what are the
     corresponding physical addresses?

PART-B

Q2 (a) Explain in detail the architecture of a microkernel-based operating system.   (9)

(b) Explain 7-state process state diagram including suspended processes.   (6)

Q3 (a) Explain Dining-philosopher problem and provide its solution using   (6)
     Semaphores.

(b) Consider the following scenario of processes with time quantum=2   (9)

Process	Arrival time	Execution Time
P1	0	9
P2	1	5
P3	2	3
P4	3	4

Draw the Gantt Chart for the execution of the processes showing their start
and end time using round robin scheduling. Calculate turnaround time,
normalized turnaround time, waiting time for each process and average
turnaround time, average normalized turnaround time, average waiting time
for the system.

Q4 (a) What is Process Control Block? What are the various attributes associated   (6)
with a process that are contained in PCB?

(b) Consider the following page reference string: (9)
1,2,3,4,2,1,5,6,2,1,2,3,7,6,3,2,1,2,3,6.   Implement FIFO, Optimal, LRU
page replacement algorithms and compare the performance based on the
number of page faults with frame size 3 and 4.

Q5 (a) Consider the system with following information. Determine whether the   (9)
system is in safe state. Total Resources are R1= 15, R2=8 and R3=8.

Process	Max			Allocated		
	R1	R2	R3	R1	R2	R3
P1	5	6	3	2	1	0
P2	8	5	6	3	2	3
P3	4	8	2	3	0	2
P4	7	4	3	3	2	0
P5	4	3	3	1	0	1

If System is in safe state and this moment, if P4 requests two more
instances of R1 and two instances of R3, will the system still be in safe
state?

(b) What are the basic problems in designing multiprogramming -based modern   (6)
operating systems?

Q6 (a) Discuss various user-based scheduling goals and system-based scheduling   (9)
goals.

(b) In a system, the following state of processes and resources are given: (6)
R1→P1, P1→R2, P2→R3, R2→P2, R3→P3, P3→P4, R4→P4, P4→R1,
R1→R5.Draw the RAG for the system and Check for deadlock condition.

Q7   Write a note on any three of the following: (15)
(i)   System Calls
(ii)   Device Controllers & Device Drivers
(iii)   File Management
(iv)   Disk Scheduling Algorithms