Course Code : CST 226 **KQLR/RS – 24 / 1055**

Fourth Semester B. Tech. (Computer Science and Engineering) Examination

OPERATING SYSTEMS

Time : 3 Hours] [Max. Marks : 60

Instructions to Candidates :—

(1) Attempt all questions.
(2) All question carry marks as indicated against them.
(3) Due credit will be given to neatness and adequate dimensions.

1. (A) Describe with a neat schematic the microkernel approach to designing an operating system. Bring out the specific merits and limitations of this approach. 5(CO1)

(B) Bring out the differences between symmetric and asymmetric multiprocessing. State advantages and disadvantage of multiprocessor systems. 5(CO1)

2. (A) Consider the OS snapshot executing 5 processes in a single-processor system as mentioned below –

Process #	Burst Time	Arrival Time	Priority
P1	10	5	3
P2	4	3	1
P3	2	0	3
P4	3	1	4
P5	5	2	2

A lower priority number implied a higher priority.

Compute the average waiting time, average turnaround time and average response time for the mentioned OS snapshot.

Apply following algorithms –

(1) Preemptive Priority Scheduling.

(2) SRTF Scheduling.

Use Gantt chart representation, individual tabular representation for each scheduling method and show representative intermediate calculations. 6(CO2)

(B) Contrast between the user thread and kernel thread. Discuss benefits of multithreading. 4(CO2)

3. (A) Is it possible to have concurrency but not parallelism ? Explain.

What is busy waiting ? Can busy waiting be avoided altogether ? Explain with the help of pseudocode. 6(CO3)

(B) Illustrate how a binary semaphore can be used to implement mutual exclusion among N processes. 4(CO3)

4. Consider the following snapshot of a system :

P#	Allocation			
	A	B	C	D
$\mathbf{P_0}$	2	0	0	1
$\mathbf{P_1}$	3	1	2	1
$\mathbf{P_2}$	1	3	1	2
$\mathbf{P_3}$	2	1	0	3
$\mathbf{P_4}$	1	4	3	2

Max			
A	B	C	D
4	2	1	2
5	2	5	2
1	4	2	4
2	3	1	6
3	6	6	5

(i) Given that Available = {3, 3, 2, 1}, illustrate that the system is in a safe state by demonstrating an order in which the processes may complete. (step-by-step manner).

(ii) If a request from process P1 arrives for (1, 1, 0, 0), can the request be granted immediately ? 10(CO3,2)

5. (A) Draw a neat sketch and describe paging hardware with TLB. 4(CO4)

(B) Consider the following page reference string :

7, 2, 3, 1, 2, 5, 3, 4, 6, 7, 7, 1, 0, 5, 4, 6, 2, 3, 0, 1.

Assuming demand paging with three frames. How many page faults would occur for following page replacement algorithms ?

(i) FIFO Algorithm.

(ii) LRU Algorithm.

(iii) OPT Algorithm. 6(CO4,3)

6. (A) Discuss the approaches to handle bad blocks in disk storage. 4(CO4)

(B) Suppose a disk has 256 cylinders numbered from 0 to 255. The drive is currently serving a request at cylinder 40 and the previous request was at cylinder 90. The queue of pending request in FIFO order is :

105, 135, 190, 20, 55, 80, 210, 150, 125, 50

Starting from the current head position, what is the total distance (in cylinders) that the disk moves to satisfy all pending request for —

(i) LOOK algorithm.

(ii) C-SCAN algorithm.

(iii) SSTF algorithm. 6(CO4)