Printed Pages:03 **Sub Code:KCS-401**

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B.TECH.
(SEM IV) THEORY EXAMINATION 2022-23
OPERATING SYSTEMS

Time: 3 Hours ***Total Marks: 100***

Note: Attempt all Sections. If require any missing data; then choose suitably.

SECTION A

1. Attempt *all* questions in brief. 2 x 10 = 20

(a) Define two main functions of an operating system.
(b) Explain the principal advantages of multiprogramming.
(c) Define the term busy waiting.
(d) Define semaphore and its types.
(e) Explain starvation problem and its solution.
(f) Explain internal and external fragmentation.
(g) Explain thrashing and locality of reference.
(h) Distinguish between physical and logical address space of a process.
(i) Explain various operations associated with a file.
(j) Explain tree level directory structure.

SECTION B

2. Attempt any *three* of the following: 10x3=30

(a) Explain the following terms in detail:
(i) Multiprocessor operating system
(ii) Real time system
(iii) Time sharing system

(b) For the following processes, draw Gantt chart to illustrate the execution using,
(i) Preemptive priority scheduling
(ii) Non-Preemptive priority scheduling.
Also, Calculate average waiting time and average turnaround time.
(Assumption: A larger priority number has higher priority.)

Process	Arrival Time	Burst Time	Priority
A	0	5	4
B	2	4	2
C	2	2	6
D	4	4	3

(c) Consider the given snapshot of a system with five processes (P0,P1,P2,P3,P4) and three resources (A,B,C).

	Allocation	MAX	Available
Process/Resource	A B C	A B C	A B C
P0	1 1 2	4 3 3	2 1 0
P1	2 1 2	3 2 2	
P2	4 0 1	9 0 2	
P3	0 2 0	7 5 3	
P4	1 1 2	11 2 3	

(i) Calculate the content of Need Matrix.
(ii) Apply safety algorithm and check the current system is in safe state or not.
(iii) If the request from process P1 arrives for (1,1,0), can the request be granted immediately?

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(d) Define process and process control block. Also, describe process state transition diagram in detail.

(e) Explain the concept of paging. Also, explain paging hardware support using TLB with suitable diagram

SECTION C

3. Attempt any *one* part of the following: 10x1=10

(a) Explain the term RAID and its characteristics. Also, explain various RAID levels with their advantages and disadvantages.

(b) Explain the concept of file system management. Also, explain various file allocation and file access mechanisms in details.

4. Attempt any *one* part of the following: 10x1=10

(a) Explain producer consumer problem and its solution using semaphore.

(b) Explain dinning philosopher problem and its solution using semaphore.

5. Attempt any *one* part of the following: 10x1=10

(a) Explain the concept of demand paging. Consider the given references to the following pages by a program:
0,9,0,1,8,1,8,7,8,7,1,2,8,2,7,8,2,3,8,3
How many pages faults will occur if the program has three-page frames available to it and uses:
(i) FIFO replacement
(ii) LRU replacement
(iii) Optimal replacement

(b) Explain the terms hit ratio and miss ratio. On a simple paged system, associative registers hold the most active page entries and the full-page table is stored in main memory. If references satisfied by associative registers take 100ns, and references through main memory page table takes 180 ns, what must the hit ratio be to achieve an effective access time of 125 ns?

6. Attempt any *one* part of the following: 10x1=10

(a) Explain the following terms:
(i) Multilevel feedback Queue Scheduling
(ii) Fixed portioning vs. variable partitioning

(b) Suppose the following disk request sequence (track numbers) for a disk with 100 tracks is given: 45, 20, 90, 10, 50, 60, 80, 25, 70. Assume that the initial position of the R/W head is on track 49. Calculate the net head movement using:
(i) SSTF
(ii) SCAN
(iii) CSCAN
(iv) LOOK

7. Attempt any *one* part of the following: 10x1=10

(a) Explain Deadlock and necessary conditions for deadlock. Also, Explain resource allocation graph with suitable diagram.

(b) Explain the followings:
(i) Buffering
(ii) Polling
(iii) Direct Memory Access (DMA)

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