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**Question Paper Code: U3804**

B.E./B.Tech. DEGREE EXAMINATION, NOV 2025

Third Semester

Information technology

21UIT304– PRINCIPLES OF OPERATING SYSTEMS

(Common to CSE,IT,CSD & AI&DS Engineering branches)

(Regulation 2021)

Duration: Three hours

Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 2 = 20 Marks)

1. The XYZ insurance company wants to automate its business process, choose any one computing technology and compare its pros and cons with other computing methods. CO2-App
2. Under what circumstances would a user be better off using a time-sharing system, rather than a PC or single -user workstation? CO2-App
3. What are the requirements that a solution to the critical section problem must satisfy? CO1- U
4. Name two hardware instructions and their definitions which can be used for implementing mutual exclusion. CO1- U
5. What is Swapping CO1- U
6. Define contagious memory allocation CO1- U
7. Define hypervisor CO1- U
8. State the limitations of virtualization CO1- U
9. What is meant by Locality of Reference? CO1- U
10. Express the views on –disk structure in file system implementation CO1- U

PART – B (5 x 16= 80 Marks)

11. (a) How the processes cooperatively work in the system and discuss it? CO1- U (16)

Or

- (b) How the operating systems ensure the hardware protection? CO1- U (16)

12. (a) Consider a five Philosophers who spend their lives thinking and eating, when a philosopher thinks, she does not interact with her colleagues, she gets to hungry and tries to pick up the two chopstick that are closest to her. she may pick up only one chopstick at a time and she cannot pick up a chopstick that is already in the hand of a neighbor and eats without releasing her chopsticks provide a solution to this problem using semaphores

Or

- (b) Consider the following set of processes with the length of the CPU burst time given in milliseconds

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

The processes are assumed to have arrived in the order p1,p2,p3,p4,p5 all at time 0.

(i) Draw four Gantt charts illustrating the execution of these processes using FCFS,SJF a non-preemptive priority(lowest priority consider the highest Priority), RR (time Quantum=1 ms) scheduling.

(ii) What is the turnaround time of each process for each of the scheduling algorithms.

(iii) What is the waiting time of each process for each of the scheduling algorithms ?

(iv) Which of the schedules in part a results in the minimal average waiting time?

13. (a) Consider the following snapshot of a system: CO2- App (16)

				Process	Allocation	Max	Available
A	B	C	D	A B C D	A B C D		
				P0	0 0 1 2	0 0 1 2	1 5 2 0
				P1	1 0 0 0	1 7 5 0	
				P2	1 3 5 4	2 3 5 6	
				P3	0 6 3 2	0 6 5 2	
				P4	0 0 1 4	0 6 5 6	

Answer the following questions using the banker's algorithm:

- a. What is the content of the matrix *Need*? Is the system in a safe state?
- b. If a request from process P1 arrives for (0, 4, 2, 0), can the request be granted immediately?

Or

- (b) 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. CO2- App (16)

Perform the allocation of processes using-

First Fit Algorithm

Best Fit Algorithm

Worst Fit Algorithm

Assuming a 1-KB page size, what are the page numbers and offsets for the following address references (provided as decimal numbers):

- a. 2375b. 19366c. 30000d. 256e. 16385

14. (a) Consider the following pager reference string CO2- App (16)

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 the following replacement algorithms

1. LRU replacement
2. FIFO replacement
3. Optimal replacement

Or

- (b) Why can VMMs not implement trap-and-emulate-based virtualization on some CPUs? Lacking the ability to trap-and-emulate, what method can a VMM use to implement virtualization CO2- App (16)
15. (a) Consider a disk with 200 tracks and the queue has random requests from different processes in the order:  
55, 58, 39, 18, 90, 160, 150, 38, 184  
Initially arm is at 100.  
Find the Average Seek length using FIFO, SSTF, SCAN and C-SCAN algorithm CO2- App (16)
- Or
- (b) Illustrate an application that could benefit from operating system support for random access to indexed files. CO2- App (16)