Reg. No. : | | | | | | | | | | | | |

Question Paper Code: R3804

B.E./B.Tech. DEGREE EXAMINATION, NOV 2024

Third Semester

Information technology

R21UIT304– PRINCIPLES OF OPERATING SYSTEMS

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

(Regulation R2021)

Duration: Three hours | Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 2 = 20 Marks)

1.	List the advantages of peer-to-peer systems over client-server systems	CO1	U
2.	Can traps be generated intentionally by a user program? If so, for what purpose?	CO3	Ana
3.	In which order should we choose to abort? 1. Priority of the process 2. How long process has computed, and how much longer to completion 3. Resources the process has used	CO1	U
4.	Compare preemptive and non-preemptive scheduling	CO1	U
5.	Summarize the conditions under which a deadlock situation may arise?	CO1	U
6.	Consider a logical address space of eight pages of 1024 words each, mapped onto a physical memory of 32 frames. How many bits are in the logical address and physical address?	CO2	App
7.	Outline on Demand Paging?	CO1	U
8.	Explain the steps required to handle a page fault in demand paging?	CO1	U
9.	Explain the purpose of the open() and close() operations.	CO1	U
10.	Explain, why is rotational latency usually not considered in disk scheduling? How would you modify SSTF, SCAN, and C-SCAN to include latency optimization?	CO1	U

PART – B (5 x 16= 80 Marks)

11. (a) (i) What is a Process? Explain the Process Control Block and the various Process States (8) CO1 U (16)
(ii) Explain Process Creation and Process Termination (8)

Or

(b) Explain the inter process communication in detail 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 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 CO2 App (16)

Or

(b) Consider the following set of processes, with the length of the CPU – burst time is given in ms: CO2 App (16)

Process	Burst Time
P0	10
P1	4
P2	8
P3	6

Draw four Gantt charts illustrating the execution of these processes using FCFS, SJF, Priority and RR (quantum=2) scheduling. Also calculate waiting time and turnaround time for each scheduling algorithms.

13. (a) Given six memory partitions of 300 KB, 600 KB, 350 KB, 200 KB, 750 KB,and 125 KB (in order), how would the first-fit, best-fit, and worst-fit algorithms place processes of size 115 KB, 500 KB, 358 KB, 200 KB, and375 KB (in order)? Rank the algorithms in terms of how efficiently they use memory CO2 App (16)
Most systems allow programs to allocate more memory to its address space during execution. Data
allocated in the heap segments of programs is an example of such allocated memory. What is
required to support dynamic memory allocation in the following scheme

Most systems allow programs to allocate more memory to its address space during execution. Data allocated in the heap segments of programs is an example of such allocated memory. What is required to support dynamic memory allocation in the following scheme

Or

(b) Consider the following system snapshot using data structures in the banker's algorithm, with resources A, B, C and D and process P0 to P4. CO2 App (16)

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

Apply banker's algorithm, Answer the following questions:

a) How many resources of type A, B, C and D are there? (2)

b) Find the need matrix? (3)

c) Is the system in a safe state? Why? (3)

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

7, 0,1, 2, 0, 3, 0, 4, 2, 3, 0, 3, 2, 1, 2, 0, 1, 7, 0, 1

How many page faults would occur for the following replacement algorithms, assuming three frames that all frames are initially empty?

a. LRU page replacement.

b. FIFO page replacement

c. Optimal page replacement

Or

(b) Consider a system with 80% hit ratio, 50 Nano-seconds time to search the associative registers, 750 Nano-seconds time to access memory. CO2 App (16)

Find the time to access a page

(a) When the page number is in associative memory

(b) When the time to access a page when not in associative memory.

(c) Find the effective memory access time.

15. (a) Explain the disk scheduling algorithms in detail with example CO1 U (16)

Or

(b) Outline the various disk space allocation methods. Explain in detail CO1 U (16)