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

Question Paper Code: U3804

B.E./B.Tech. DEGREE EXAMINATION, NOV 2023

Third Semester

Computer Science Engineering

21UIT304 PRINCIPLES OF OPERATING SYSTEMS

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

(Regulations 2021)

Duration: Three hours Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 2 = 20 Marks)

1.	What is the main difficulty that a programmer must overcome in writing an operating system for a real-time environment?.	CO1- U
2.	What is the purpose of the command interpreter? Why is it usually separate from the kernel?	CO1- U
3.	Name two hardware instructions and their definitions which can be used for implementing mutual exclusion	CO1- U
4.	Differentiate preemptive and non-preemptive scheduling	CO1- U
5.	Compare paging with segmentation with respect to the amount of memory required by the address translation structures in order to convert virtual addresses to physical addresses	CO1- U
6	Suppose that a system is in an unsafe state. Show that it is possible for the processes to complete their execution without entering a deadlock state	CO2-App
7	What is meant by Demand Paging?	CO1- U
8	If the average page faults service time of 25ms and a memory access time of 100ns, calculate the effective access time	CO2-App
9	Give an example of an application in which data in a file should be accessed in the following order: i. sequential ii. Random	CO2-App
10	Mention the reason that why rotational latency usually not considered in disk scheduling?	CO1- U

PART – B (5 x 16= 80 Marks)

11. (a) Describe the system calls and system process with a real time example. CO1-U (16)

Or

(b) Compare the different types of Operating systems with their pros and cons CO1-U (16)

12. (a) Using semaphores, design a solution to manage clients access to five banking tellers given the following operation scenario: The bank has a space with 15 chairs and a standing area that can accommodate up to 10 clients. Hence, the maximum number of clients allowed to enter the bank branch is 25. A client needs to wait for an empty chair before sitting. A client will not be served except after receiving a ticket. To obtain a ticket, the client needs to enter his ID. When a teller is available, one. 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, and RR (quantum=2) scheduling. Also calculate waiting time and turnaround time for each scheduling algorithms.

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)	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)
14.	(a)	Consider the following page reference string 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 frame sthat all frames are initially empty? (i) LRU page replacement. (ii) FIFO page replacement (iii) Optimal page replacement	CO2-App	(16)
		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. Find the time to access a page (i) When the page number is in associative memory (ii) When the time to access a page when not in associative memory. (iii) Find the effective memory access time.	CO2-App	(16)
15.	(a)	Explain the disk scheduling algorithms in detail with example	CO1-U	(16)
		Or		
	(b)	Why rotational latency is usually not considered in disk scheduling?How would you modify SSTF, SCAN, and C-SCAN to include latency optimization?.	CO1-U	(16)