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VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN
[AUTONOMOUS INSTITUTION AFFILIATED TO ANNA UNIVERSITY, CHENNAI]
Elayampalayam – 637 205, Tiruchengode, Namakkal Dt., Tamil Nadu.

Question Paper Code: 60030

B.E. / B.Tech. DEGREE END-SEMESTER EXAMINATIONS – JAN. 2025

Fourth Semester

Information Technology

U19IT408 – OPERATING SYSTEMS

(Regulation 2019)

Time: Three Hours

Maximum: 100 Marks

Answer ALL the questions

Knowledge Levels (KL)	K1 – Remembering	K3 – Applying	K5 - Evaluating
	K2 – Understanding	K4 – Analyzing	K6 - Creating

PART – A

(10 x 2 = 20 Marks)

Q.No.	Questions	Marks	KL	CO
1.	Why the Operating System is called as a resource allocator and Control program?	2	K1	CO1
2.	Categorize the types of system calls.	2	K2	CO1
3.	Why is Shortest Job First (SJF) Algorithm should called an Optimal algorithm?	2	K1	CO2
4.	Give two hardware instructions and their definitions which can be used for implementing mutual exclusion.	2	K2	CO2
5.	List out the deadlock characteristics.	2	K1	CO3
6.	Identify the need of contiguous memory allocation.	2	K2	CO3
7.	What is the significance of page replacement approach?	2	K1	CO4
8.	Is compaction is differs from contiguous memory allocation? Justify.	2	K2	CO4
9.	Contrast the Application I/O Interface and Kernel I/O subsystem.	2	K2	CO5
10.	How free-space is managed using bit vector implementation?	2	K1	CO5

PART – B

(5 x 13 = 65 Marks)

Q.No.	Questions	Marks	KL	CO
11. a)	i. Explain the operating system structures with a neat sketch	6	K2	CO1
	ii. Compare multiprocessing and multiprogramming with examples.	7	K2	CO1
(OR)				
b)	i. In a multiprogramming and time-sharing environment, several users share the system simultaneously. This situation can result in various security problems. a. What are two such problems? b. Can we ensure the same degree of security in a time-shared machine as we have in a dedicated machine? Explain your answer.	6	K2	CO1
	ii. Outline the benefits and challenges of distributed systems.	7	K2	CO1
12. a)	Consider the following set of processes, with the length of the CPU-burst time given in milliseconds:		K3	CO2

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 (a smaller priority number implies a higher priority), and RR (quantum = 1) scheduling.	8		
	What is the turnaround time and waiting time of each process for each of the scheduling algorithms?	5		
(OR)				
b)	i. Outline the dining-philosopher critical section problem solution using monitor	9	K3	CO2
	ii. Write the algorithm using test-and-set() instruction that satisfy all the critical section requirements.	4	K3	CO2

13. a) Consider the following system : 13 K3 CO3

	Allocation				Max				Available			
	A	B	C	D	A	B	C	D	A	B	C	D
P0	0	0	1	2	0	0	1	2	0	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 based on banker's algorithm

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

(OR)

b) Explain about the difference between internal fragmentation and external fragmentation with examples. 13 K3 Co3

14. a) Consider the following reference string 13 K2 CO4
 7,0,1,2,0,3,0,4,2,3,0,3,2,1,2, 0,1,7,0,1. Assume there are three frames. Apply LRU replacement algorithm to the reference string above and find out how many page faults are produced. Illustrate the LRU page replacement algorithm in detail.

(OR)

b) Consider a system where free space is kept in a free-space list. 13 K3 CO4

- i. Suppose that the pointer to the free-space list is lost. Can the system reconstruct the Free-space list? Explain your answer.
- ii. Suggest a scheme to ensure that the pointer is never lost as a result of memory failure. Fragmentation on a storage device could be eliminated by recompactation of the information. Typical disk devices do not have relocation or base registers (such as are used when memory is to be compacted), so how can we relocate files? Give three reasons why recomposing and relocation of files often are avoided.

15. a) Explain the following:

- | | | | |
|---|---|----|-----|
| i. Contiguous File Allocation | 5 | K2 | CO5 |
| ii. Linked File Allocation | 4 | | |
| iii. Indexed sequential File Allocation | 4 | | |

(OR)

b) Organize the roles of device controller and device driver in storage management. 13 K3 CO5

PART – C

(1 x 15 = 15 Marks)

Q.No.	Questions	Marks	KL	CO
16. a)	<p>A file is to be shared among different processes, each of which has a unique priority number. The file can be accessed simultaneously by several processes, subject to the following constraint:</p> <p>The sum of all unique numbers associated with all the processes currently accessing the file must be less than n. Use semaphores to coordinate the access to the file.</p>	15	K3	CO2
	(OR)			
b)	<p>Suppose that a disk drive has 5000 cylinders, numbered 0 to 4999. The drive is currently serving a request at cylinder 143, and the previous request was at cylinder 125. The queue of pending requests, in FIFO order, is 86, 1470, 913, 1774, 948, 1509, 1022, 1750, 130. Starting from the current head position, what is the total distance (in cylinders) that the disk arm moves to satisfy all the pending requests, for each of the following disk-scheduling algorithms?</p> <p>i. FCFS ii. SSTF iii. SCAN</p>	15	K3	CO5