



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

Question Paper Code: 130021

B.E. / B.Tech. DEGREE END-SEMESTER EXAMINATIONS – JAN. 2026

Fourth Semester

Computer Science and Engineering

U23CT407 – OPERATING SYSTEMS

(Common to IT)

(Regulation 2023)

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.	Distinguish between the client-server and peer-to-peer models of distributed systems.	2	K2	CO1
2.	What is the mode of the system at a. Boot time? b. When the OS gains control? c. When a user program is running?	2	K2	CO1
3.	In the time sharing system, When the time slot given to a process is completed, the process goes from Running state to which state?	2	K2	CO2
4.	At a particular time the value of counting semaphore is 10. When it will become 7.	2	K3	CO2
5.	What are the four necessary conditions for characterizing deadlock?	2	K1	CO3
6.	Assume that you have a page-reference string for a process with m frames (initially all empty). The page-reference string has length p; n distinct page numbers occur in it. Answer these questions for any page-replacement algorithms: a. What is a lower bound on the number of page faults? b. What is an upper bound on the number of page faults?	2	K3	CO3
7.	What problems could occur if a system allowed a file system to be mounted simultaneously at more than one location?	2	K2	CO4
8.	How free-space is managed using bit vector implementation?	2	K2	CO4
9.	Distinguish bit-level striping and block-level striping.	2	K2	CO5
10.	Define rotational latency and disk bandwidth.	2	K1	CO5

PART – B

(5 x 13 = 65 Marks)

- | Q.No. | Questions | Marks | KL | CO |
|--------|---|-------|----|-----|
| 11. a) | List five services provided by an operating system. Explain how each provides convenience to the users. Explain also in which cases it would be impossible for user level programs to provide these services. | 13 | K2 | CO1 |

(OR)

- | | | | | |
|--------|---|----|----|-----|
| b) i. | What is the difference between kernel and user mode? Explain how having two distinct modes aids in designing an operating system. (7) | 13 | K2 | CO1 |
| ii. | Explain the various types of System calls with an example for each. (6) | | | |
| 12. a) | Consider the following set of processes, with the length of the CPU burst given in milliseconds: | 13 | 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.

- Draw four Gantt charts illustrating the execution of these processes using FCFS, SJF, non preemptive priority (a smaller priority number implies a higher priority), and RR (quantum = 2) scheduling.
- What is the turnaround time of each process for each of the scheduling algorithms in part a & (i)?
- What is the waiting time of each process for each of the scheduling algorithms in part a & (i)?
- Which of the schedules in part a & (i), results in the minimal average waiting time (over all processes)?

(OR)

- | | | | | |
|-------|---|----|----|-----|
| b) i. | A counting semaphore was initialised to 7. Then 20 P (wait) operations and x V (signal) operations were completed on this semaphore. If the final value of semaphore is 5, then compute the value of x. (7) | 13 | K3 | CO2 |
| ii. | What is critical section problem? Explain two process solutions. (6) | | | |

13. a) Consider the following snapshot of a system:

13 K3 CO3

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:

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

(OR)

- b) Given memory partitions of 100KB, 500KB, 200KB, 300KB, and 600KB (in order), how would each of the first-fit, best-fit, worst fit algorithms place processes of 212KB, 417KB, 112KB, and 426KB (in order). Which algorithm makes the most efficient use of memory?

13 K3 CO3

14. a) What are points to be consider in file system design? Explain linked list allocation & index allocation in detail.

13 K2 CO4

(OR)

- b) Explain in detail about various ways of free space management.

13 K2 CO4

15. a) 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

13 K3 CO5

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

- i. FCFS
- ii. SSTF
- iii. SCAN
- iv. LOOK
- v. C-SCAN

(OR)

- b) What is Virtual Machine? Explain Types of Virtual Machines and their Implementations.

13 K2 CO5

PART – C

(1 x 15 = 15 Marks)

Q.No.	Questions	Marks	KL	CO
16. a)	<p>Consider a situation where we have a file shared between many people. If one of the people tries editing the file, no other person should be-reading or writing at the-same time, otherwise changes will not be visible to him/her. However if some person is reading the file, then others may read it at the same time.</p> <p>i. What kind of situation is this?</p> <p>ii. Consider the following problem parameters to solve this situation.</p>	15	K3	CO2

Problem parameters:

- One set of data is shared among a number of processes.
- Once a writer is ready, it performs its write. Only one writer may write at a time.
- If a process is writing, no other process can read it.
- If at least one reader is reading, no other process can write.
- Readers may not write and only read.

(OR)

b)	<p>Consider the following page reference string: 1, 2, 3, 4, 2, 1, 5, 6, 2, 1, 2, 3, 7, 6, 3, 2, 1, 2, 3, 6.</p> <p>How many page faults would occur for the following replacement algorithms, assuming four, five, six frames? Remember all frames are initially empty, so your first unique pages will all cost one fault each.</p> <ul style="list-style-type: none"> • LRU replacement • FIFO replacement • Optimal replacement 	15	K3	CO3
----	--	----	----	-----