



B.E/B.TECH DEGREE EXAMINATIONS: APRIL /MAY 2024

(Regulation 2018)

Fourth Semester

COMPUTER SCIENCE AND ENGINEERING

U18CSI4202: Operating Systems

COURSE OUTCOMES

- CO1: Apply the concepts of CPU scheduling and Process synchronization.
 CO2: Experiment creation of different virtual machines in a hypervisor.
 CO3: Simulate the principles of memory management.
 CO4: Identify appropriate file system and disk organizations for a variety of computing scenario.
 CO5: Examine the features of various open source operating systems.

Time: Three Hours

Maximum Marks: 100

**Answer all the Questions:-
 PART A (10 x 2 = 20 Marks)
 (Answer not more than 40 words)**

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|--|-----|-------------------|
| 1. What is a process? | CO1 | [K ₁] |
| 2. Why race condition occurs? | CO1 | [K ₂] |
| 3. State the advantages of Multi-threading. | CO1 | [K ₁] |
| 4. List out the requirements of Critical section problem's solution | CO1 | [K ₁] |
| 5. Illustrate the structure of Inode. | CO1 | [K ₂] |
| 6. Consider a single level paging scheme. The virtual address space is 4 MB and page size is 4 KB. What is the maximum page table entry size possible such that the entire page table fits well in one page? | CO3 | [K ₃] |
| 7. Let the page fault service time be 10 ms in a computer with average memory access time being 20 ns. If one page fault is generated for every 10 ³ memory accesses, what is the effective access time for the memory? | CO3 | [K ₃] |
| 8. What is Thrashing? Illustrate the effect of Thrashing. | CO3 | [K ₃] |
| 9. List out the disadvantages of Indexed allocation of disk space. | CO4 | [K ₁] |
| 10. What is rotational latency. | CO4 | [K ₁] |

Answer any FIVE Questions:-
PART B (5 x 16 = 80 Marks)
(Answer not more than 400 words)

11. a) Explain the ways in which inter process communication happens in cooperating process. 10 CO1 [K₂]
 b) State any three system calls related to process and explain its functionalities. 6 CO1 [K₂]
12. Find the average turnaround and average waiting time using SRTF (Shortest Remaining Time First), round robin (with time slice = 2 ns) and Preemptive priority scheduling algorithms. 16 CO1 [K₃]

Process	Arrival time (ns)	Burst time (ns)	Priority
P1	1	5	2
P2	2	2	2
P3	0	5	3
P4	4	3	4
P5	0	3	1(highest priority)

13. a) Explain process synchronization using TestAndset hardware instruction. 8 CO1 [K₂]
 b) Describe how synchronization is achieved using semaphores in Readers-Writer's problem. 8 CO1 [K₂]
14. a) Consider a system with five processes P0 through P4 and three resources of type A, B, C. Resource type A has 10 instances, B has 5 instances and type C has 7 instances. The snapshot of the system is as follows: 8 CO1 [K₃]

Process	Allocation			Max			Available		
	A	B	C	A	B	C	A	B	C
P ₀	0	1	0	7	5	3	3	3	2
P ₁	2	0	0	3	2	2			
P ₂	3	0	2	9	0	2			
P ₃	2	1	1	2	2	2			
P ₄	0	0	2	4	3	3			

- Is the system in a safe state? If Yes, then what is the safe sequence?
15. b) Explain the structure of a page table? 8 CO3 [K₁]
 a) Consider the page references 0,1,2,0,1, 3,0, 4, 3, 2, 3, 0, 3, 2, 3 with 4 page frame. Find number of page fault using and FIFO Optimal Page replacement algorithm. 8 CO3 [K₃]
 b) Explain any three directory structure. 8 CO4 [K₁]
16. a) Explain about process and memory management in Linux? 8 CO5 [K₁]
 b) Consider a disk system with 100 cylinders. The requests to access the cylinders occur in following sequence: 14, 34, 20, 17, 19, 73, 2, 15, 6, 22. The head is currently at cylinder 50, what is the time taken to satisfy all requests if it takes 1ms to move from one cylinder to adjacent one using shortest seek time first and FIFO algorithm. 8 CO4 [K₃]
