

B.E DEGREE EXAMINATIONS: NOV/DEC 2024

(Regulation 2018)

Fourth Semester

INFORMATION SCIENCE AND ENGINEERING

U18ISI4202: 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. How does virtual memory improve system performance? | CO1 | [K ₂] |
| 2. Outline the role of the kernel in an operating system, and how does it facilitate communication between hardware and software. | CO1 | [K ₂] |
| 3. How do semaphores help to prevent deadlock. | CO2 | [K ₂] |
| 4. Identify the requirements to solve the critical-section problem. | CO2 | [K ₂] |
| 5. List the use of fork and exec system calls. | CO3 | [K ₂] |
| 6. How does Copy-on-Write (COW) improve the efficiency of process creation in operating systems? | CO3 | [K ₂] |
| 7. Compare sequential access, direct access and indexed access, highlighting its advantages and disadvantages. | CO4 | [K ₂] |
| 8. List the key characteristics of global allocation strategy. | CO5 | [K ₂] |
| 9. Outline the components of a file system in an operating system? | CO4 | [K ₂] |
| 10. Is swap-space management contributing to system performance? Justify your answer. | CO5 | [K ₂] |

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

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|--|---|-----|-------------------|
| 11. a) Describe the different types of system calls and their significance in operating systems. | 8 | CO2 | [K ₂] |
|--|---|-----|-------------------|

b) Explain the concept of paging in memory management and its advantages. 8 CO3 [K₂]

12. a) Consider the following set of processes with their burst times and arrival times. 16 CO1 [K₃]
Calculate the average waiting time and turnaround time, Gantt chart for the following algorithm.

Process	Arrival Time	Burst Time
P1	0	8
P2	1	4
P3	2	9
P4	3	5

- (a) First-Come-First Serve (FCFS) scheduling.
- (b) Shortest Job First (SJF) scheduling (non-preemptive).
- (c) Round Robin (RR) scheduling with a time quantum of 3 units.
- (d) Compare the average waiting times and turnaround times of each algorithm and discuss which one provides better performance for this set of processes.

13. a) Discuss the techniques used for deadlock avoidance in OS 8 CO2 [K₂]

b) Illustrate the concept of segmentation in memory management and explain how it differs from paging. 8 CO3 [K₂]

14. a) Consider a system with 3 available frames in physical memory. The following sequence of page references is given: 10 CO2 [K₃]

Page Reference String:

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

Simulate the following page replacement algorithms and find the number of page faults for each:

- a) First-In-First-Out (FIFO)
- b) Optimal Page Replacement (OPT)
- c) Least Recently Used (LRU)

Compare the number of page faults for each algorithm and discuss which

algorithm performs better for this reference string.

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|--------|---|----|-----|-------------------|
| b) | Discuss the various file types, file operations and the role of file control blocks (FCB) in file management | 6 | CO4 | [K ₂] |
| 15. a) | Elaborate on different allocation methods used in file systems for managing disk space with their advantages and disadvantage. | 8 | CO5 | [K ₂] |
| b) | Define Peterson's Solution, and how does it address the critical section problem in concurrent programming? | 8 | CO5 | [K ₂] |
| 16. a) | Discuss various disk scheduling algorithms (FCFS, SSTF, SCAN, C-SCAN) and their effectiveness in reducing seek time and improving overall disk performance with examples. Compare their advantages and disadvantages of algorithm | 16 | CO4 | [K ₃] |
