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Question Paper Code : 90924

B.E./B.Tech. DEGREE EXAMINATIONS, APRIL/MAY 2025.

Fourth Semester

Computer Science and Engineering

CS 3451 — INTRODUCTION TO OPERATING SYSTEMS

(Common to : Information Technology)

(Regulations 2021)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Define user mode and kernel mode. Why two modes are required?
2. List any four process management system call.
3. State the effect of increasing the time quantum to an arbitrary large number and decreasing the time quantum to an arbitrary small number for round robin scheduling algorithm with suitable example.
4. What is process control block? List out the data field associated with PCB.
5. Give two hardware instructions and their definitions which can be used for implementing mutual exclusion.
6. State Belady's Anomaly and the reason why it occurs.
7. What is internal fragmentation and external fragmentation?
8. What is File Mounting?
9. List the advantages of Virtualization.
10. What are the limitations of Mobile OS?

PART B — (5 × 13 = 65 marks)

11. (a) Illustrate system call working principles with an example by explaining the control flow.

Or

- (b) Give an overview of Operating System Services.

12. (a) Consider following processes with length of CPU burst time in millisecond. All processes arrived in order p1, p2, p3, p4, p5 all at time zero.

Process	Burst time	Priority
P1	10	3
P2	1	1
P3	2	3
P4	1	4
P5	5	2

- (i) Draw Gant charts illustrating execution of these processes for SJF, non pre-emptive priority (smaller priority number implies a higher priority) and Round Robin (quantum = 1)
- (ii) Calculate turnaround time for each process for scheduling algorithm.
- (iii) Calculate waiting time for each scheduling algorithm.

Or

- (b) A barbershop consists of a waiting room with n chairs and a barber with one barber chair. If there are no customers to be served, the barber goes to sleep. If a customer enters the barbershop and all chairs are occupied, then the customer leaves the shop. If the barber is busy but chairs are available, then the customer sits in one of the free chairs. If the barber is asleep, the customer wakes up the barber. Explain with an algorithm how to coordinate between the barber and the customers.

13. (a) Consider the following reference string: 0, 2, 1, 6, 4, 0, 1, 0, 3, 1, 2, 1. Illustrate in detail different page replacement algorithms with the example string.

Or

- (b) Segmentation is similar to paging but uses variable-sized “pages”. Brief on Segmentation and Paging and enumerate the differences.

14. (a) Explain in detail the Disk Scheduling algorithms with examples.

Or

- (b) Elaborate the major disk allocation methods of disk space.

15. (a) Discuss in detail the types of Virtual Machines and their Implementations.

Or

- (b) Compare and contrast of iOS and Android, with neat diagram, explain the layers and components of Android OS Architecture. (13)

PART C — (1 × 15 = 15 marks)

16. (a) Given memory partitions of 100 K, 500 K, 200 K, 300 K, and 600 K (in order), how would each of the First-fit, Best-fit, and Worst-fit algorithms place processes of 212 K, 417 K, 112 K, and 426 K (in order)? Which algorithm makes the most efficient use of memory? Explain in detail with illustrations.

Or

- (b) Consider the following questions based on the banker's algorithm:

	Allocation	Max	Available
	A B C D	A B C D	A B C D
P_0	0 0 1 2	0 0 1 2	1 5 2 0
P_1	1 0 0 0	1 7 5 0	
P_2	1 3 5 4	2 3 5 6	
P_3	0 6 3 2	0 6 5 2	
P_4	0 0 1 4	0 6 5 6	

- (i) Define safety algorithm. (5)
- (ii) What is the content of the matrix Need? (3)
- (iii) Is the system in a safe state? (2)
- (iv) If a request from process P_1 arrives for (0, 4, 2, 0), can the request be granted immediately? (5)

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Table 1. Results of the experiments.

The results are given in Table 1. The results are given in Table 1.

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Table 1. Results of the experiments.

Experiment	Results	Results	Results
1	0.000	0.000	0.000
2	0.000	0.000	0.000
3	0.000	0.000	0.000
4	0.000	0.000	0.000
5	0.000	0.000	0.000

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