

Question Paper Code : 30030

B.E./B.Tech. DEGREE EXAMINATIONS, APRIL/MAY 2023

Fourth Semester

Computer and Communication Engineering

AL 3452 – OPERATING SYSTEMS

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(Common to Artificial Intelligence and Data Science / Computer Science and
Business Systems)

(Regulations 2021)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. List any two objectives of the Operating System.
2. Name the System Call used to create processes on UNIX systems.
3. Define Process Control Block.
4. State any two differences between user thread and kernel thread.
5. What is Demand Paging?
6. Define Thrashing.
7. State Rotational Latency.
8. Distinguish Sharable and Dedicated Device.
9. Define para virtualization.
10. Name the mechanism that Android uses to discover and identify activities, and services.

PART B — (5 × 13 = 65 marks)

11. (a) Explain the Functions and Services of Operating Systems in detail.

Or

- (b) Discuss the various structures of Operating Systems in detail.

12. (a) Consider the following set of processes, with the length of the CPU burst time given in milliseconds.

Process	Burst Time	Priority
P1	2	2
P2	1	1
P3	8	4
P4	4	2
P5	5	3

The processes are assumed to have arrived in the order P1, P2, P3, P4, P5, all at time 0.

- Sketch the diagram of Gantt chart that illustrates the execution of these processes using the following scheduling algorithms: SJF, non-preemptive priority scheduling (a larger priority number implies a higher priority). (4)
- Compute the turnaround time of each process for each of the scheduling algorithms. (4)
- Compute the waiting time of each process for each of these scheduling algorithms. (4)
- Which of the algorithms results in the minimum average waiting time (over all processes)? (1)

Or

- (b) An operating system uses the banker's algorithm for deadlock avoidance when managing the allocation of three resource types X, Y and Z to three processes A, B and C. There are (7, 8, 6) units of each resource type available in the system. The table given below presents the current system state. Here, the Allocation matrix shows the current number of resources of each type allocated to each process and the Max matrix shows the maximum number of resources of each type required by each process during its execution.

Resources/ Processes	Allocation			Max		
	X	Y	Z	X	Y	Z
A	2	0	1	5	4	3
B	3	2	2	4	3	3
C	1	1	3	3	3	5

- (i) Compute Need Matrix (3)
- (ii) Calculate the safety sequence of the system (7)
- (iii) If process C requests for additional resources (1,0,1) check if that can be granted. (3)

13. (a) (i) Distinguish Static and Dynamic Partitions of memory. (3)
 (ii) Given memory partitions of 100K, 400K, 200K, 300K, and 600K. (10)
 How would each of the First-fit, Best-fit, and Worst-fit algorithms place processes of 112K, 317K, 212K, and 62K? Which algorithm makes the Most efficient use of memory?

Or

- (b) (i) Describe the concept of paging and its address translation mechanism in detail. (7)
 (ii) Compute the number of page faults using First In First Out (FIFO) for the following Page Reference String in which the physical memory has 3 frames. (6)

5 3 4 0 1 2 3 6 7 5
 4 0 1

14. (a) Illustrate the logical structure of a file directory in detail and compare the structures.

Or

- (b) (i) Compute the total head movements (in number of cylinders) while servicing the requests using SCAN and LOOK. disk scheduling algorithms and compare the performance. Consider a disk queue with requests for I/O to disk blocks on cylinders 68, 173, 41, 102, 15, 134, 55, 67, 90, 182. The head is initially at cylinder number 50. The cylinders are numbered from 0 to 199. (8)
 (ii) Write a short note on Free Space Management. (5)
15. (a) Summarize the major types of Virtual Machines and their implementation in detail.

Or

- (b) Explain the Design Goals and the architecture of Android with a neat sketch.

PART C — (1 × 15 = 15 marks)

16. (a) Perform a comparative analysis of the Operating Systems WINDOWS, LINUX, ANDROID and IOS based on the following features:
- Manufacturer
 - Computer Architecture
 - File System Supported
 - Memory Management Technique Used

- User Friendliness
- Security
- Reliability
- Compatibility

Or

- (b) The Fibonacci sequence is the series of numbers 0, 1, 1, 2, 3, 5, 8, etc., Formally, it can be expressed as: $fib_0 = 0$, $fib_1 = 1$, $fib_n = fib_{n-1} + fib_{n-2}$.

Write a multithreaded program in C that generates the Fibonacci sequence. This program should work as follows: On the command line, the user should enter the number of Fibonacci numbers that the program should generate. The program should then create a separate thread for generating the Fibonacci numbers, placing the sequence in data that can be shared by the threads. When the thread finishes execution, the parent thread should output the sequence generated by the child thread. Because the parent thread cannot begin outputting the Fibonacci sequence until the child thread finishes, the parent thread will have to wait for the child thread to finish.

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