Reg. No. : E N G G T R E E . C O M

Question Paper Code : 50902

B.E./B.Tech. DEGREE EXAMINATIONS, APRIL/MAY 2024.

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. How does an interrupt differ from a trap?
2. What is the purpose of system calls?
3. Define the process states.
4. What are the threading issues?
5. What is the purpose of paging the page tables?
6. Define the benefits of virtual memory.
7. Write short notes on free space management.
8. State the functions of file system.
9. What is paravirtualization?
10. What is the major design goal for the android platform?

PART B — (5 × 13 = 65 marks)

11. (a) (i) What is the main difficulty that a programmer must overcome in writing an operating system for a real-time Environment? (7)

(ii) Describe three general methods for passing parameters to the operating system. (6)

Or

(b) (i) Consider a computing cluster consisting of two nodes running a database. Describe two ways in which the cluster software can manage access to the data on the disk. Discuss the benefits and disadvantages of each. (7)

(ii) List five services provided by an operating system, and explain how each creates convenience for users. In which cases would it be impossible for user-level programs to provide these services? Explain your answer. (6)

12. (a) (i) Describe how processes are created and terminated in an operating system. (7)

(ii) Give an example of a situation in which ordinary pipes are more suitable than named pipes and an example of a situation in which named pipes are more suitable than ordinary pipes. (6)

Or

(b) (i) Describe how deadlock is possible with the dining-philosopher's problem. (7)

(ii) Consider the following snapshot of a system. (2+2+2)

	Allocation	*Max*	*Available*
	ABCD	*ABCD*	*ABCD*
T_0	0012	0012	1520
T_1	1000	1750	
T_2	1354	2356	
T_3	0632	0652	
T_4	0014	0656	

Answer the following questions using the banker's algorithm:

(1) What is the content of the matrix Need?

(2) Is the system in a safe state?

(3) If a request from thread T1 arrives for (0,4,2,0) can the request be granted immediately

13. (a) (i) Explain the difference between internal and external fragmentation. (7)

(ii) On a system with paging, a process cannot access memory that it does not own. Why? How could the operating system allow access to additional memory? Why should it or should it not? (6)

Or

(b) (i) Illustrate how pages are loaded into memory using demand paging. (7)

(ii) Under what circumstances do page faults occur? Describe the actions taken by the operating system when a page fault occurs. (6)

14. (a) (i) Is disk scheduling, other than FCFS scheduling, useful in a single-user environment? Explain your answer. (7)

(ii) Describe three circumstances under which blocking I/O should be used. Describe three circumstances under which nonblocking I/O should be used. (6)

Or

(b) (i) Consider a file system in which a file can be deleted and its disk space reclaimed while links to that file still exist. What problems may occur if a new file is created in the same storage area or with the same absolute path name? How can these problems be avoided? (7)

(ii) Contrast the performance of the three techniques for allocating disk blocks (contiguous, linked, and indexed) for both sequential and random file access. (6)

15. (a) (i) Describe four virtualization-like execution environments, and explain how they differ from "true" virtualization. (7)

(ii) Why are VMMs unable to implement trap-and-emulate-based virtualization on some CPUs? Lacking the ability to trap and emulate, what method can a VMM use to implement virtualization? (6)

Or

(b) (i) Describe the three types of traditional hypervisors. (7)

(ii) Discuss about the mobile operating system with suitable example. (6)

PART C — (1 × 15 = 15 marks)

16. (a) Assume that a program has just referenced an address in virtual memory. Describe a scenario in which each of the following can occur. (If no such scenario can occur, explain why) (3+4+4+4)

(i) TLB miss with no page fault

(ii) TLB miss with page fault

(iii) TLB hit with no page fault

(iv) TLB hit with page fault

Or

(b) Apply the (i) FIFO, (ii) LRU, and (iii) optimal (OPT) replacement algorithms for the page-reference strings: (5+5+5)

4, 2, 1, 7, 9, 8, 3, 5, 2, 6, 8, 1, 0, 7, 2, 4, 1, 3, 5, 8

Indicate the number of page faults for each algorithm assuming demand paging with three frames.

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B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2023.

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. "OS is a control program". Justify the statement with an example scenario.
2. Define system call. Give any two system calls with their purpose.
3. Draw the life cycle of a process.
4. Compare process creation and thread creation in terms of economy.
5. What is trashing?
6. List the advantages of demand paging.
7. Give the role of operating system in free space management.
8. List the various file access methods.
9. What are the benefits of virtual machines?
10. List any two components that are unique for mobile OS.

PART B — (5 × 13 = 65 marks)

11. (a) (i) List down the objectives and functions of Operating Systems. (6)

(ii) Detail the various types of user interfaces supported by Operating Systems. (7)

Or

(b) (i) Explain various structures of Operating System. (6)

(ii) Explain the purpose and importance of system calls in detail with examples. (7)

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

Process	Burst Time
P1	10
P2	1
P3	2
P4	5

(i) Draw Gantt's Chart illustrating the execution of these processes using FCFS, SJF and Round Robin (with quantum = 1) scheduling techniques. (6)

(ii) Find the Turnaround time and waiting time of each process using the above technique. (7)

Or

(b) (i) What are semaphores? How do they implement mutual exclusion? (6)

(ii) Explain the techniques used to prevent deadlocks. (7)

13. (a) Explain the need and concept of paging technique in memory management. (13)

Or

(b) Consider the page reference string: 1 2 3 4 1 3 0 1 2 4 1 and 3 page frames. Find the page faults, hit ratio and miss ratio using FIFO, optimal page replacement and LRU schemes. (13)

14. (a) Write detailed notes on file system interface and file system structure. (13)

Or

(b) Following are the references attempted to hard disks: 67,22,78,34,21,78,99. Recommend a suitable disk scheduling algorithm among FIFO, SSTF, SCAN and LOOK after applying all. Provide statements that support your recommendation.
(Note: Initial head position is at 20.) (13)

15. (a) Explain various types of virtual nachines and their implementations in detail. (13)

Or

(b) (i) Explain the architecture of Android OS. (6)

(ii) Compare iOS with Android OS. (7)

PART C — (1 × 15 = 15 marks)

16. (a) Consider three processes, all arriving at time zero, with total execution time of 10, 20 and 30 units respectively. Each process spends the first 20% of execution time doing I/O, the next 70% of time doing computation, and the last 10% of time doing I/O again. The operating system uses a shortest remaining compute time first scheduling algorithm and schedules a new process either when the running process gets blocked on I/O or when the running process finishes its compute burst. Assume that all I/O operations can be overlapped as much as possible.

(i) Calculate average waiting time and average turnaround time (5)

(ii) Draw Gantt chart of CPU burst (5)

(iii) Calculate CPU idle time (5)

Or

(b) Consider the following scenario. There are 4 segments in a program of sizes, A0=400B, A1=100B, A2=21B and A3=365B. Assume that the main memory address ranges from 0 to 1999, among which the following are the available free slots: 50-350, 450-500, 670-1060 and 1200-1850. Answer the followings:

(i) Provide diagrammatic representation of logical memory to physical memory (5)

(ii) Provide segment map table and draw a suitable memory management unit (5)

(iii) Find out internal, external and total fragmentation (3)

(iv) List the segments of following physical addresses: 1050, 560, 78, 2000. (2)