26·11·2024 (E)

SOMAIYA VIDYAVIHAR UNIVERSITY

Semester: July 2024 –November 2024		
Maximum Marks: 100 **Examination: ESE Examination**		**Duration:3 Hrs.**
Programme code: 01 **Programme: Computer Engineering**	**Class:** TY	**Semester:V (SVU 2020)**
Institute/School/Department: K J Somaiya School of Engineering	**Name of the department:**COMP	
Course Code: 116U01C503	**Name of the Course: Operating Systems**	
Instructions: 1)Draw neat diagrams 2) All questions are compulsory **3) Assume suitable data wherever necessary**		

Que. No.	Question	Max. Marks
Q1	Solve any **Four**	**20**
i)	Explain the system booting process with a neat diagram.	5
ii)	Define the following parameters with respect to choice of an appropriate scheduling algorithm – Throughput, Efficiency, Fairness, Turnaround time, Response time.	5
iii)	What is demand paging? State any two advantages and disadvantages of demand paging scheme of memory management.	5
iv)	Discuss evolution of OS.	5
v)	Explain the sequential and indexed-sequential file organization methods.	5
vi)	Discuss binary and counting semaphores. Write pseudocode for wait and signal semaphore primitives.	5

Que. No.	Question	Max. Marks
Q2 A	Solve the following	**10**
i)	What is multithreading? Can user level threads support multithreading? Justify your answer.	5
ii)	Explain how the PCB is used during context switching between processes. Also describe why PCBs are critical to process management in a multitasking operating system.	5
	OR	
Q2 A	Consider the set of process CPU burst time (in milliseconds) shown below.	10

Process	Burst Time
P0	26
P1	3
P2	7
P3	2

Illustrate the scheduling of processes using First Come First Served (FCFS) with the help of Gantt charts under the following conditions:

A. All processes arrive at the same time.
B. Processes arrive according to the shortest burst time.

Analyse the issues in above scenario. Comment on average waiting time.

Q 2 B	Solve any **One**	10
i)	Consider the sleeping barber problem- Imagine a barbershop with a single barber and a row of waiting chairs for customers. The barber spends most of his time cutting hair, but when there are no customers, he takes a nap in the barber chair. When a customer arrives at the barbershop and finds the barber sleeping, they wake him up and get a haircut. If other customers arrive while the barber is busy, they either wait in the chairs if there are empty seats or leave if all the chairs are occupied. The key challenge in this scenario is to ensure that customers are served in a fair and orderly manner, without overcrowding the shop or having customers wait indefinitely. A. Discuss issues with respect to process synchronization and concurrency. B. If a solution is to be designed for this problem using semaphore and/or mutex, List items/objects for which semaphores could be used. State types of suggested semaphores. C. Justify your semaphore choices.	10
ii)	For an instance of readers-writer' s problem involving many readers and many writers- A. Discuss and justify issues with respect to process synchronization and concurrency. B. If a solution is to be designed for this problem using monitors, which conditional variables would be more significant? Discuss your approach.	10

Que. No.	Question	Max. Marks
Q3	Solve any **Two**	20
i)	Consider the given instance of Banker's algorithm. A. Apply the Banker's algorithm to figure out if the system is in safe state or unsafe state. B. If the system is in safe state, give sequence of process execution.	10
ii)	Explain the concepts of main memory, physical memory, logical memory, and virtual memory in detail. Discuss the relationship between these different types of memory and how they interact within a modern operating system.	10
iii)	Discuss various hardware approaches for concurrency and synchronization. Should they be a recommended practice? Justify your answer.	10

	Allocation				*Request*				*Available*			
	R_1	R_2	R_3	R_4	R_1	R_2	R_3	R_4	R_1	R_2	R_3	R_4
P_1	1	0	0	0	0	1	0	0	2	0	0	0
P_2	0	1	0	0	0	0	1	0				
P_3	0	0	1	0	0	0	0	1				
P_4	0	1	0	1	1	0	0	0				
P_5	0	0	0	1	0	0	0	0				

Que. No.	Question	Max. Marks
Q4	Solve any **Two**	**20**
i)	Consider a disk with tracks numbered from 0 to 199. The I/O requests are received for tracks- 98, 183, 41, 122, 14, 124, 65, and 67. The read-write head starts at track 53. A. Calculate the total head movements and average seek time using the disk scheduling algorithms: a. First-Come, First-Serve (FCFS) b. SCAN B. Illustrate the head movement with a suitable graph.	10
ii)	A. What are the file inodes? Discuss contents of Unix file inode. B. Assuming that a disk block structure can hold 10 direct memory addresses for a file, explain with a neat diagram how the file management module can support files of very large sizes.	10
iii)	A. Discuss various file Directory structures in terms of their characteristics. B. For each structure, identify the advantages and disadvantages in terms of usability, access efficiency, and data organization	10

Que. No.	Question	Max. Marks
Q5	Solve any **Four**	**20**
i)	Discuss device drivers as interface between OS and hardware.	5
ii)	What is thrashing? How does it affect performance?	5
iii)	Discuss the necessary and sufficient condition for a deadlock to occur in system?	5
iv)	Discuss the advantages and disadvantages of FIFO and LRU page replacement policies.	5
v)	Explain circular I/O buffering technique. State applications of the same.	5
vi)	Compare and contrast best fit and worst fit memory allocation methods. Support your answer with a suitable example.	5

Semester: January 2023 –May 2023		
Maximum Marks: 100	Examination: ESE Examination(KT)	Duration:3 Hrs.
Programme code: 01 Programme: B. Tech in Computer Engineering	Class: TY	Semester: V(SVU 2020)
Name of the Constituent College: K. J. Somaiya College of Engineering	Name of the department: COMP	
Course Code: 116U01C503	Name of the Course: Operating System	
Instructions: 1)Draw neat diagrams 2) All questions are compulsory 3) Assume suitable data wherever necessary		

Que. No.	Question	Max. Marks
Q1	Solve any **Four**	20
i)	With respect to System Software, Describe assembler and loaders.	5
ii)	Differentiate between Compiler and Interpreter	5
iii)	Illustrate the Process State Transition Diagram with suitable diagram.	5
iv)	Explain the concept of Resource pre-emption for Recovery from Deadlock	5
v)	With respect to Linux Operating System, Define Inodes with suitable diagram.	5
vi)	With respect to Memory Management, Describe Internal and External Fragmentation.	5

Que. No.	Question	Max. Marks
Q2 A	Solve the following	10
i)	Describe the System Boot Process.	5
ii)	Define shell. Further Comment on the different types of shells.	5
	OR	
Q2 A	Illustrate the following types of Operating System Structures with the help of suitable examples:- i. Traditional UNIX System Structure ii. Layered Approach iii. Microkernel System Structure	10
Q 2 B	Solve any **One**	10
i)	Compare and Contrast between Multilevel Queue and Multilevel Feedback Queue Scheduling Algorithms with the help of suitable diagrams.	10
ii)	Differentiate between User level Threads and Kernel Level Threads. Further Describe the various Multithreading Models.	10

Que. No.	Question	Max. Marks
Q3	Solve any **Two**	20
i)	Consider the methods used by processes P1 and P2 for accessing their critical sections whenever needed, as given below. The initial values of shared Boolean variables S1 and S2 are randomly assigned. Method Used by P1 while (S1 == S2) ;	10

	Critical Section S1 = S2; Method Used by P2 while (S1 != S2) ; Critical Section S2 = not (S1); Analyse the methods and State whether Mutual Exclusion and Progress Requirement are being satisfied or not. Justify your answer.	
ii)	Discuss the Semaphore solution for Dining Philosophers Problem.	10
iii)	With respect to Process Synchronization, Examine the Bounded Buffer Problem and Readers Writer Problem.	10

Que. No.	Question	Max. Marks
Q4	Solve any **Two**	**20**
i)	Consider a disk queue with requests for I/O to blocks on cylinders in order 43, 33, 127, 87, 17, 99, 20. The head is initially at cylinder number 60, moving towards larger cylinder numbers on its servicing pass. The cylinders are numbered from 0 to 199. If the following Disk Scheduling algorithms are applied:- a) C-LOOK b) C-SCAN For all the algorithms, Find the order in which the requests will be serviced. Further Calculate the total head movement (in number of cylinders) incurred while servicing these requests.	10
ii)	With respect to File Management, Illustrate the various File Allocation Methods with suitable diagrams.	10
iii)	Discuss the Address Translation Scheme to map Pages into frames with the help of suitable diagrams. Further Explain the concept of Segmentation with an example.	10

Que. No.	Question	Max. Marks
Q5	Solve any **four**	**20**
i)	Describe System Calls ,Further list the types of system calls.	5
ii)	Describe Linux Scheduling.	5
iii)	Distinguish between Message Passing and Shared Memory	5
iv)	Explain the concept of Monitors with the help of suitable diagrams.	5
v)	Discuss the various Input/Output Buffering schemes with suitable diagrams for each.	5
vi)	Discuss the structure of Hashed Page Table with the help of suitable diagrams.	5

27-12-2022 (E)

SOMAIYA VIDYAVIHAR UNIVERSITY

Semester: August 2022 – December 2022 Maximum Marks: 100 Examination: ESE Examination Duration: 3hours		
Programme code: 01 Programme: B Tech Computer Engineering	Class: ~~FY/SY~~/TY/~~LY~~	Semester: ~~I/II/III/IV~~/V/~~VI/VII/VIII~~ (SVU 2020)
Name of the Constituent College: K. J. Somaiya College of Engineering		Name of the department: COMP/~~ETRX/EXTC/IT/MECH~~
Course Code: 116U01C503	Name of the Course: Operating System	
Instructions: 1) Draw neat diagrams 2)Assume suitable data if necessary		

Question No.		Max. Marks
Q1 (a)	Differentiate between monolithic and microkernel	05
Q1 (b)	Define the term Critical section and Race condition.	05
Q1 (c)	What is Process Control Block (PCB)?	05
Q1 (d)	Explain the effect of page size on the performance of a process.	05
Q2 (a)	Given five memory partitions of 100 KB, 500 KB, 200 KB, 300 KB, and 600 KB (in order), how would each of the first-fit, best-fit, and worst-fit algorithms place processes of 212 KB, 417 KB, 112 KB, and 426 KB (in order)? Which algorithm makes the most efficient use of memory?	10
Q2 (b)	What are System calls? List and explain file-handling system calls. OR Explain Process control fork(), exec(), and wait() System calls.	10
Q3 (a)	Explain the following in brief:(anyone) 1. Semaphores 2. Scheduling in Linux system	10
Q3 (b)	Assume the following processes arrive for execution at the indicated time and the CPU burst time is given in ms.	10

Process	Burst Time	Arrival Time	Priority
P1	10	0	5
P2	6	0	2
P3	7	1	4
P4	4	1	1
P5	5	2	3

Find the Average waiting time, and the average turnaround time for FCFS, SJF(Non-preemptive), and Round Robin(Quantum-3ms)

Q4 (a)	Explain the difference between Paging and Segmentation. OR Explain the hardware support for Paging.	10
Q4 (b)	On a disk with 1000 cylinders, numbers 0-999, compute the number of tracks the disk arm must move to satisfy all requests in the disk queue. Assume the last request received was at track 345 and the head is moving toward track 0. The queue in the FIFO order contains requests for the following tracks 123, 874, 692, 475, 105, 376. Perform the computation for the following scheduling algorithms: i. FIFO ii. SSTF iii. SCAN	10
Q5 (a)	Consider the given snap of the System Answer the following questions using Bankers algorithm. 1) What is the content of Matrix need? 2) Is the system in a safe state? 3) If a request from process P1 arrives for (1,3,2,1) can the request be granted immediately?	10
Q5 (b)	Explain the conditions for deadlock. Suggest techniques to avoid deadlock. OR Explain an algorithm for the producer-consumer problem.	10

	Allocation				Max				Available			
	A	B	C	D	A	B	C	D	A	B	C	D
P0	0	2	1	2	0	3	2	2	2	5	3	2
P1	1	1	0	2	2	7	5	2				
P2	2	2	5	4	2	3	7	6				
P3	0	3	1	2	1	6	4	2				
P4	2	4	1	4	3	6	5	8				

29·5·2019 (E)

K. J. Somaiya College of Engineering, Mumbai-77
(Autonomous College Affiliated to University of Mumbai)

End Semester Examinations
May-June 2019

Max. Marks:100 **Duration: 3hrs**
Class: Third year Semester: V
Name of the Course: Operating System Branch: Comp
Course Code: UCEC501

Instructions:
(1) All Questions are Compulsory
(2) Draw neat diagrams
(3) Assume suitable data if necessary

Question No.		Marks
Q 1 (a)	List and explain objectives and functions of operating system	10
Q 1 (b)	Distinguish between Layered V/S Monolithic structure of operating system	10
Q2 (a)	Explain process state transition diagram and types schedulers	10
	OR	
Q2 (a)	Explain preemptive and non- preemptive scheduling algorithms	10
Q2 (b)	Consider the following set of processes, with the length of the CPU burst given in milliseconds. Processes: p1,p2,p3,p4,p5 Burst Time: 2,1,8,4,5 Priority: 2,1,4,2,3 The processes are assumed to have arrived in the order p1,p2,p3,p4,p5, all at time 0. 1) Draw three Gantt charts by using the following scheduling algorithms: FCFS, SJF and RR (quantum=2). 2) What is the turnaround and waiting time of each process 3) Which of the algorithms results in the minimum average waiting time (over all process).	10
Q3 (a)	Explain the Readers –Writers problem with structure process	10
	OR	
Q3 (a)	Explain characteristics of modern operating system	10
Q3 (b)	Consider the following snapshot of a system.	10

Processes	Allocation (ABCD)	Max (ABCD)	Available (ABCD)
P0	2001	4212	3321
P1	3121	5252	
P2	2103	2316	
P3	1312	1424	
P4	1432	3665	

Answer the following questions using the banker's algorithm:
a. Illustrate that the system is in safe state by demonstrating an order in

	which the process may complete. b. If request from process p1 arrives for (1, 1, 0, 0), can the request be granted immediately. c. If request from process p4 arrives for (0,0,2,0), can the request be granted immediately	
Q4 (a)	List files allocation methods and describe contiguous allocation method. OR	10
Q4 (a)	Describe any two file accessing methods	10
Q4 (b)	Explain SSTF and FCFS disk scheduling algorithms	10
Q5 (a)	Explain File sharing and record Blocking	10
Q5 (b)	Compare Unix operating system and Mobile operating system (Android) OR	10
Q5 (b)	Explain I/O buffering methods	10

Semester: January 2024 –April 2024 Maximum Marks: 100 Examination: ESE Examination (KT) Duration:3 Hrs.		
Programme code: 04 Programme: B.Tech IT	Class: TY	Semester: V (SVU 2020)
Name of the Constituent College: K. J. Somaiya College of Engineering	Name of the department: IT	
Course Code: 116U04C502	Name of the Course: Operating Systems	
Instructions: 1)Draw neat diagrams 2) All questions are compulsory 3) Assume suitable data wherever necessary		

Que. No.	Question	Max. Marks
Q1	Solve any **Four**	20
i)	What are basic functions and goals of an operating system?	5
ii)	Explain types of system calls with examples.	5
iii)	Explain multiprogramming type of operating systems with example.	5
iv)	Explain layered architecture in detail.	5
v)	What are components of modern Unix systems?	5
vi)	Explain real time operating system with example.	5

Que. No.	Question	Max. Marks
Q2 A	Solve the following	10
i)	Differentiate between pre-emptive and non pre-emptive algorithms with example.	5
ii)	Differentiate between user and kernel level threads.	5
	OR	
Q2 A	Given the following: There are 5 processes that enters the system for execution. The burst time associated to each of them is 3,5,4,7,1 respectively. Assuming all of them arrive at the same time stamp "0" in the system, calculate the Average Waiting time and Average Turn around time of the system processes using shortest job first and round robin (Quantum size is: 2) algorithm. Assume suitable data(if necessary).	10
Q 2 B	Solve any **One**	10
i)	Explain 7 state process model in detail with neat diagram.	10
ii)	Explain multithreading models with neat diagram.	10

Que. No.	Question	Max. Marks
Q3	Solve any **Two**	20
i)	Define: critical section, race condition, pipe and monitor.	10
ii)	Differentiate between semaphores and mutex.	10
iii)	Explain any 2 hardware and any 2 software approaches of mutual exclusion.	10

Que. No.	Question	Max. Marks
Q4	Solve any Two	20
i)	Explain address translation in paging and segmentation with example.	10
ii)	Explain First fit, Best fit, Next fit and Worst fit placement strategies.	10
iii)	Page frame size in memory is given as 3 and the sequence of pages desired by the CPU is given as: 2,3,5,2,3,4,3,5,6,5,3,4. Assuming that initially the page frame was empty, calculate page hits and page faults for FIFO, LRU and Optimal algorithms. Assume suitable data(if necessary).	10

Que. No.	Question	Max. Marks
Q5	Write short notes on any four	20
i)	Types of I/O devices.	5
ii)	Characteristics of I/O devices.	5
iii)	OS design issues for I/O management.	5
iv)	Types of I/O buffering techniques.	5
v)	Secondary storage management.	5
vi)	Free space management.	5

SOMAIYA VIDYAVIHAR UNIVERSITY 08·06·2023(E)

Semester: January 2023 –May 2023		
Maximum Marks: 100	Examination: ESE Examination – KT	Duration:3 Hrs.
Programme code: 04 Programme: B.Tech (IT)	Class: TY	Semester: V (SVU 2020)
Name of the Constituent College: K. J. Somaiya College of Engineering	Name of the department: Information Technology	
Course Code: 116U04C502	Name of the Course: Operating Systems	
Instructions: 1)Draw neat diagrams 2) All questions are compulsory 3) Assume suitable data wherever necessary		

Que. No.	Question	Max. Marks
Q1	Solve any **Four**	**20**
i)	What is an Operating System and its services?	5
ii)	Write basic commands of Linux (any five).	5
iii)	Write a note on Monolithic Kernel.	5
iv)	What are system calls? Explain the different categories of the system calls.	5
v)	Write a note on Real-time OS.	5
vi)	What is the purpose of command interpreter? Why is it usually separate from the Kernel?	5

Que. No.	Question	Max. Marks
Q2 A	Solve the following	**10**
i)	Draw and explain 7 state process diagram.	5
ii)	Explain multithreading models with diagram. OR	5
Q2 A	Explain critical section and race condition with example.	10
Q 2 B	Solve any **One**	**10**
i)	Consider the set of 6 processes whose arrival time and burst time are given below	10

Process	Burst Time	Arrival Time
P0	11	1
P1	9	6
P2	7	7
P3	12	4
P4	14	3
P5	5	2

Calculate the average waiting time and average turnaround time for
a) Shortest remaining time first
b) Round Robin (Quantum Size =4)

ii)	What do you mean by PCB? Where is it used? What are its contents? Explain in detail.	10

<table>
<tr><th>Que. No.</th><th>Question</th><th>Max. Marks</th></tr>
<tr><td>Q3</td><td>Solve any Two</td><td>20</td></tr>
<tr><td>i)</td><td>A. What is Deadlock? And what are its necessary conditions?
B. Consider the following snapshot of a system:
<table>
<tr><th rowspan="2">Proce sses</th><th colspan="3">Allocation</th><th colspan="3">Max</th><th colspan="3">Available</th></tr>
<tr><th>A</th><th>B</th><th>C</th><th>A</th><th>B</th><th>C</th><th>A</th><th>B</th><th>C</th></tr>
<tr><td>P0</td><td>1</td><td>1</td><td>2</td><td>4</td><td>3</td><td>3</td><td>2</td><td>1</td><td>0</td></tr>
<tr><td>P1</td><td>2</td><td>1</td><td>2</td><td>3</td><td>2</td><td>2</td><td></td><td></td><td></td></tr>
<tr><td>P2</td><td>4</td><td>0</td><td>1</td><td>9</td><td>0</td><td>2</td><td></td><td></td><td></td></tr>
<tr><td>P3</td><td>0</td><td>2</td><td>0</td><td>7</td><td>5</td><td>3</td><td></td><td></td><td></td></tr>
<tr><td>P4</td><td>1</td><td>1</td><td>2</td><td>1</td><td>1</td><td>2</td><td></td><td></td><td></td></tr>
</table>
I. Calculate the need matrix?
II. Is the system in a safe state? Justify.
III. Determine the total amount of resources of each type (i.e. A, B, C)?</td><td>10</td></tr>
<tr><td>ii)</td><td>Demonstrate the complete process of Address Translation.</td><td>10</td></tr>
<tr><td>iii)</td><td>Explain Dining Philosopher problem and its solution.</td><td>10</td></tr>
</table>

Que. No.	Question	Max. Marks
Q4	Solve any **Two**	**20**
i)	Explain concept of Paging in Memory Management of Operating System with example.	10
ii)	Consider the following page reference using four frames that are initially empty. Find the page faults using LRU and FIFO algorithm, where the page reference sequence: 7,0,1,2,03,0,4,2,3,0,3,2,3.	10
iii)	What is fragmentation? Explain the types of fragmentation. Propose the solution on fragmentation.	10

Que. No.	Question	Max. Marks
Q5	Solve any **Four**	**20**
i)	Write a note on Linux memory management.	5
ii)	Explain CLOOK disk scheduling algorithms with example.	5
iii)	Write a note on ReFS file system.	5
iv)	Explain SCAN disk scheduling algorithms with example.	5
v)	Write a note on ext-4 file system.	5
vi)	Write a note on Buddy Systems.	5