Printed Page:-04 Subject Code:- BCSCY0301 Roll. No: NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA (An Autonomous Institute Affiliated to AKTU, Lucknow) **B.Tech** SEM: III - THEORY EXAMINATION (2024 - 2025) Subject: Operating Systems Time: 3 Hours Max. Marks: 100 General Instructions: IMP: Verify that you have received the question paper with the correct course, code, branch etc. 1. This Question paper comprises of three Sections -A, B, & C. It consists of Multiple Choice *Questions (MCQ's) & Subjective type questions.* 2. Maximum marks for each question are indicated on right -hand side of each question. 3. Illustrate your answers with neat sketches wherever necessary. 4. Assume suitable data if necessary. 5. Preferably, write the answers in sequential order. 6. No sheet should be left blank. Any written material after a blank sheet will not be evaluated/checked. 20 **SECTION-A** 1. Attempt all parts:-1-a. The core component of an Operating System that directly interacts with hardware 1 (CO1,K1) Shell (a) (b) Kernel (c) Process Scheduler (d) File Manager 1-b. Which type of Operating System is used in embedded systems? (CO1,K1) 1 (a) Batch OS Real-time OS (b) Multiprocessor OS (c) (d) Multitasking OS Which scheduler determines which processes are admitted into the system for 1 1-c. processing? (CO2,K2)

- (a) Long Term Scheduler
- (b) Short Term Scheduler
- (c) Medium Term Scheduler
- (d) I/O Scheduler
- 1-d. Which of the following is not the state of a process?(CO2,K2)
 - (a) New

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- (b) Old
- (c) Waiting
- (d) Running

1-e. In the Reader-Writer problem, the problem occurs when:(CO3,K2)

- (a) Writers are blocked while a reader is reading
- (b) Only one writer can write at a time
- (c) Multiple readers can read simultaneously but writers need exclusive access
- (d) Readers and writers have the same priority
- 1-f. A binary semaphore can only have which of the following values?(CO3,K2)
 - (a) 0 or 1
 - (b) Any integer
 - (c) Positive integers
 - (d) Negative integers
- 1-g. How does demand paging work?(CO4,K2)
 - (a) Pages are loaded into memory only when required
 - (b) All pages are loaded at once
 - (c) Pages are swapped to disk for performance
 - (d) None of the above
- 1-h. In a system using the Optimal page replacement algorithm, what is replaced?(CO4,K2)
 - (a) The page that will not be needed for the longest period of time
 - (b) The least recently used page
 - (c) The page that has been in memory the longest
 - (d) None of the above
- 1-i. When a user job starts in a two level directory system, or a user logs in which of 1 the following?(CO5,K1)
 - (a) the users user file directory is searched
 - (b) the system's master file directory is not searched
 - (c) the master file directory is indexed by user name or account number, and each entry points to the UFD for that user
 - (d) all of the mentioned
- 1-j. To organise file systems on disk which is True? (CO5,K1)
 - (a) they are split into one or more partitions
 - (b) information about files is added to each partition
 - (c) they are made on different storage spaces
 - (d) all of the mentioned
- 2. Attempt all parts:-
- 2.a. Differentiate between Kernel and Shell.(CO1,K1)

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2.b.	Define the role of the PCB in CPU Scheduling.(CO2,K1)				
2.c.	Write the role of synchronization in interprocess communication? (CO3,K1)				
2.d.	Explain the concept of paging in memory management.(CO4,K2)				
2.e.	Define a distributed system .(CO5,K1)				
SECTIO	<u>)N-B</u>			30	
3. Answe	er any <u>five</u>	of the following:-			
3-a.	Explain the Operating System Architecture in details.(CO1,K1)				
3-b.	Explain the 6 Linux Commands with Syntax.(CO1,K2)				
3-с.	Discuss the different types of the Scheduler.(CO2,K2)			6	
3-d.	Apply the First-Come-First-Served (FCFS) Scheduling Processes:				
	Process P1 P2 P3 P4 Calculate	Arrival Time Bu 0 4 1 3 2 2 3 1 the waiting time ar	rst Time nd turnaround time for each process. (CO2,K3)		
3.e.	Identify the challenges caused by race conditions and propose solutions to mitigate them.(CO3,K2)			6	
3.f.	Consider page reference string 1, 3, 0, 3, 5, 6, 3 with 3 page frames. Find the number of page faults using FIFO and LRU Page Replacement Algorithm. (CO4,K2)				
3.g.	Discuss the advantages and disadvantages of shared memory systems.(CO5,K2)				
SECTIO	DN-C			50	
4. Answe	er any <u>one</u> o	of the following:-			
4-a.	Explain the functions of an operating system. Discuss the key components and 10 their roles in managing hardware and software resources.(CO1,K2)				
4-b.	Analyze the role of the 'nice' command in Linux. Explain its usage with examples. 10 in detail.(CO1,K3)				
5. Answe	er any <u>one</u> o	of the following:-			
5-a.	Given the quantum of waiting tim Process P1 P2 P2	following processe of 4 units, calculate me and average tur Arrival Time 0 1 2	es with their arrival times and burst times, and a time e the waiting time, turnaround time, and average naround time for Round Robin scheduling:(CO2,K3) Burst Time 5 3	10	
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	Simulate the Round Robin process execution by cycling through the processes with a time quantum of 4 units. a.Calculate the completion time, waiting time, and turnaround time for each process. b. Calculate the average waiting time and average turnaround time.	
5-b.	Discuss the Process Performance Criteria, Process Transition Diagram with an example.(CO2,K2)	10
6. Answe	r any <u>one</u> of the following:-	
6-a.	If there are 6 units of resource R in the system and each process in the system requires 2 units of resource R, then how many processes can be present at maximum so that no deadlock will occur?Explain the conditions of the Deadlock avoidance.(CO3,K2)	10
б-b.	Explain the purpose and usage of lock variables in process synchronization. How do lock variables help in managing access to critical sections? Discuss their advantages and disadvantages.(CO3,K2)	10
7. Answe	er any <u>one</u> of the following:-	
7-a.	Explain the memory hierarchy and differentiate between local and physical memory space and explain the contiguous memory management technique.(CO4,K1)	10
7-b.	Consider the page references 7, 0, 1, 2, 0, 3, 0, 4, 2, 3, 0, 3, 2, 3 with 4 page frame. Find number of page fault using Optimal Page Replacement Algorithm. Define Belady's Anamoly.(CO4,K3)	10
8. Answe	r any <u>one</u> of the following:-	
8-a.	Describe the role of free space management in file systems. Explain the differences between the Bit Vector method and the Linked List method for managing free space. What are the advantages and disadvantages of each method in terms of efficiency and complexity?(CO5,K2)	10
8-b.	Differentiate between CPUs and GPUs .Discuss the architecture of a virtual machine and its components. How does virtualization allow multiple VMs to run on a single physical machine?(CO5,K2)	10

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