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Printed Page:-4 **Subject Code:- CMCA0103**

Roll. No:

NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA
(An Autonomous Institute Affiliated to AKTU, Lucknow)
MCA
SEM: I - THEORY EXAMINATION (2025 - 2026)
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.*

SECTION-A 20

1. Attempt all parts:-

1-a. Among the following which is not a type of OS? (K1,CO1) 1

(a) Batch
(b) Time sharing
(c) Compiler based
(d) Real time

1-b. Fork() system call is used to:(K2,CO1) 1

(a) Terminate process
(b) Create process
(c) Block process
(d) Resume process

1-c. Semaphore is a/an _____ to solve the critical section problem.(K2,CO2) 1

(a) hardware for a system
(b) special program for a system
(c) integer variable
(d) none of the mentioned

1-d. A Process Control Block contains (K1,CO2) 1

(a) Program Counter
(b) Process state
(c) Process ID
(d) all of the mentioned

1-e. Program always deals with _____(K1,CO3) 1

(a) logical address
(b) absolute address
(c) physical address
(d) relative address

1-f. The time taken to move the disk arm to the desired cylinder is called the (K1,CO3) 1

(a) positioning time
(b) random access time
(c) seek time
(d) rotational latency

1-g. Command used to print current working directory is(K2,CO4) 1

(a) ls
(b) pwd
(c) echo
(d) whoami

1-h. _____ command is used to count the total number of lines, words, and characters contained in a file?(K1,CO4) 1

(a) wc
(b) wcount
(c) countw
(d) None of above

1-i. Working of exit command in a shell script (K2,CO5) 1

(a) Closes the terminal window.
(b) Terminates the current loop
(c) Terminates the script execution
(d) Restarts the system

1-j. 1

_____ command is used to close the vi editor? (K2,CO5)

(a) q
(b) wq
(c) ls
(d) Both q and wq

2. Attempt all parts:-

2.a. Differentiate hard real time and soft real time operating system.(K2,CO1) 2

2.b. Explain Deadlock Prevention. (K2,CO2) 2

2.c. List the major differences between paging and segmentation.(K2,CO3) 2

2.d. Apply the cp command in Linux and write its syntax.(K3,CO4) 2

2.e. Differentiate shell & Kernel. (K2,CO5) 2

SECTION-B 30

3. Attempt all parts:-

3.a. Answer any one of the following:-

3.a.(i)	Demonstrate with a diagram how a Monolithic Kernel differs from a Microkernel in structure.(K4,CO1)	6
3.a.(ii)	Discuss various functions of Operating Systems? Explain them in detail. (K2,CO1)	6
3.b. Answer any one of the following:-		
3.b.(i)	Explain Semaphore. Also differentiate Binary & Counting Semaphore. (K4,CO2)	6
3.b.(ii)	Sketch a Resource Allocation Graph for single and multi-instance resources.(K4,CO2)	6
3.c. Answer any one of the following:-		
3.c.(i)	Explain the concept of paging and demonstrate how logical address is converted into physical address. (K3,CO3)	6
3.c.(ii)	Consider a disk queue with requests for I/O to blocks on cylinders 98, 183, 41, 122, 14, 124, 65, 67. The LOOK & C-LOOK scheduling algorithm is used. The head is initially at cylinder number 53 moving towards larger cylinder numbers on its servicing pass. The cylinders are numbered from 0 to 199. Calculate total head movement incurred while servicing these requests using SCAN & LOOK Disk scheduling algorithms. (K3,CO3)	6
3.d. Answer any one of the following:-		
3.d.(i)	Explain the working of following Linux commands- (K3,CO4) i) chmod ii)chown	6
3.d.(ii)	Compare the advantages and limitations of using chown and chmod for managing file ownership and permissions. Which command provides better control in ensuring file security? Justify your answer.(K4,CO4)	6
3.e. Answer any one of the following:-		
3.e.(i)	Write a shell script to swap two numbers. (K3,CO5)	6
3.e.(ii)	Write a shell script to print 1 to 10 numbers using for loop. (K3,CO5)	6

SECTION-C 50

4. Answer any one of the following:-

4-a.	Explain Process State Diagram in representing process behavior. Justify your answer by the working of schedulers & dispatcher. (K5,CO1)	10
4-b.	Consider processes with arrival times and burst times: P1(0,7), P2(2,4), P3(4,1), P4(5,4). Apply Preemptive SJF and Round Robin CPU Scheduling algorithms. Construct the Gantt chart and calculate average waiting and turnaround time. (For RR TQ=2) (K5,CO1)	10

5. Answer any one of the following:-

5-a.	Explain the Dining Philosopher problems of process synchronization with suitable code & diagram. (K5,CO2)	10
5-b.	Considering a system with five processes P_0 through P_4 and three resources of type A, B, C. Resource type A has 10 instances, B has 5 instances and type C has 7 instances. Suppose at time t_0 following snapshot of the system has been taken:	10

Process	Allocation	Max	Available
	A B C	A B C	A B C
P_0	0 1 0	7 5 3	3 3 2
P_1	2 0 0	3 2 2	
P_2	3 0 2	9 0 2	
P_3	2 1 1	2 2 2	
P_4	0 0 2	4 3 3	

i) Find Need Matrix
ii) Is system in safe sequence? If Yes, Find the safe sequence. (CO2, K3)

6. Answer any <u>one</u> of the following:-

6-a. Discuss the types of memory management. Demonstrate the concept of virtual memory with suitable diagram. (K5,CO3) 10

6-b. Evaluate the FIFO, LRU and optimal page replacement algorithm, assuming there are 3 frames and the page reference string is 7, 0, 1, 2, 0, 3, 0 4, 2 ,3, 0, 3, 2, 1, 2, 0, 1, 7 ,0 ,1 Find the number of page faults by using FIFO, LRU and Optimal Page Replacement Algorithm.(K5,CO3) 10

7. Answer any <u>one</u> of the following:-

7-a. Explain the working of following Linux Commands with suitable example- (K4,CO4) 10
i) cat
ii) mv
iii) cp
iv) mkdir
v) rmdir

7-b. Analyze the use of head, tail, cut & paste commands and explain their output with examples. (K4,CO4) 10

8. Answer any <u>one</u> of the following:-

8-a. Write a shell script to print all odd numbers between 0 to 20.(K5,CO5) 10

8-b. Write a shell script to find the factorial of a given number. Take the number from user as input. (K5,CO5) 10