Printed Page:-05 **Subject Code:- ACSE0403A/ACSEH0403A**

Roll. No:

NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA

(An Autonomous Institute Affiliated to AKTU, Lucknow)

B.Tech

SEM: IV - THEORY EXAMINATION (2023 - 2024)

Subject: Operating System

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. In the layered approach of Operating Systems (CO1) 1

(a) Bottom Layer(0) is the User interface

(b) Highest Layer(N) is the User interface

(c) Bottom Layer(N) is the hardware

(d) Highest Layer(N) is the hardware

1-b. To access the services of operating system, the interface is provided by the (CO1) 1

(a) System calls

(b) API

(c) Library

(d) Assembly instructions

1-c. In multilevel feedback queue CPU scheduling algorithm (CO2) 1

(a) processes are not classified into groups

(b) a process can move to a different classified ready queue...

(c) classification of the ready queue is permanent

(d) none of the mentioned

1-d. The most optimal CPU scheduling algorithm is (CO2) 1

(a) FCFS

(b) SJF

(c) Priority

(d) Round Robin

1-e. The wait-for graph is a deadlock detection algorithm that is applicable when (CO3) 1

(a) all resources have a single instance

(b) all resources have multiple instances

(c) all resources have a single 7 multiple instances

(d) all of the mentioned

1-f. A semaphore is a shared integer variable (CO3) 1

(a) that can not drop below zero

(b) that can not be more than zero

(c) that can not drop below one

(d) that can not be more than one

1-g. In contiguous memory allocation (CO4) 1

(a) each process is contained in a single contiguous section of memory

(b) all processes are contained in a single contiguous section of memory

(c) the memory space is contiguous

(d) none of the mentioned

1-h. Working set model for page replacement is based on the assumption of (CO4) 1

(a) globalization

(b) random access

(c) modularity

(d) locality

1-i. In the single level directory will happen (CO5) 1

(a) all directories must have unique names

(b) all files must have unique names

(c) all files must have unique owners

(d) all of the mentioned

1-j. In the sequential access method, information in the file is processed (CO5) 1

(a) one disk after the other, record access doesnt matter

(b) one record after the other

(c) one text document after the other

(d) none of the mentioned

2. Attempt all parts:-

2.a. Explain the components of operating system in brief. (CO1) 2

2.b. Explain the solution of starvation in priority scheduling. (CO2) 2

2.c. Differentiate between Co-operating and independent processes. (CO3) 2

2.d. Distinguish between internal and external fragmentation. (CO4) 2

2.e. Define seek time. (CO5) 2

SECTION B **30**

3. Answer any <u>five</u> of the following:-

3-a. Explain the Microkernel structure with their advantages and disadvantages. (CO1) 6

3-b. Enumerate the various types of system calls in detail. (CO1) 6

3-c. Explain the Multilevel Queue CPU scheduling algorithm with their advantages and disadvantages. (CO2) 6

3-d. Define process. Also explain the process state transition diagram with their states. (CO2) 6

3.e. Discuss the Lamport's Bakery algorithm in detail. (CO3) 6

3.f. Given memory partitions of 100KB, 500KB, 200KB, 300KB, and 600KB (in order).How would each of the First-fit, Best-fit, and Worst-fit algorithms place processes of 278KB, 415KB, 117KB, and 436KB (in order)? Which algorithm makes the most efficient use of memory? (CO4) 6

3.g. Define RAID. Explain the different levels of RAID. (CO5) 6

SECTION C **50**

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

4-a. Explain the different functions of an operating system and discuss the various services provided by an operating system. (CO1) 10

4-b. Explain the following operating systems with their advantages and disadvantages 10

i) Batch

ii) Multiprogramming

iii) Time-sharing

iv) Real time (CO1)

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

5-a. Explain the different types of thread. Also discuss the multithreaded model in detail. (CO2) 10

5-b. Let us consider the following set of five processes, with the length of CPU burst time given in milliseconds : 10

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

Draw the Gantt chart and calculate the average waiting time and turnaround time by using the following CPU scheduling algorithms

i) Preemptive Priority (Given Maximum priority=1,Minimum Priority=4)

ii) Preemptive SJF(SRTN/SRTF)

iii) Round Robin (Given Time Quantum=2 Millisecond) (CO2)

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

6-a. Define semaphore. Also discuss the solution of Bound-Buffer problem by using semaphore. (CO3) 10

6-b. Let us consider the following snapshot and answer the following: 10

Process	Current Allocation				Maximum				Available			
	R1	R2	R3	R4	R1	R2	R3	R4	R1	R2	R3	R4
P0	2	0	0	0	2	7	5	0	2	1	0	0
P1	0	0	1	2	0	0	1	2				
P2	0	3	3	4	6	6	5	6				
P3	2	3	5	4	4	3	5	6				
P4	0	0	3	2	0	6	5	2				

i. What is the content of the need matrix ?

ii. Evaluate the system is in a safe state or not?

iii. If a request from process P3 arrives for (0, 1, 0, 0) can request be granted immediately or not? (CO3)

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

7-a. Consider the following reference string 7,0,1,2,0,3,1,0,4,2,3,0,3,2,1,2,0,1,7,0,1,2. 10

How many page fault would occur for the following page replacement algorithms

i) First In First Out (FIFO)

ii) Least Recently Used (LRU)

iii) Optimal

Assume there are three frames initially empty. (CO4)

7-b. Define Paging and also explain with the help of supporting diagram how TLB improves the performance of a paging system. (CO4) 10

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

8-a. Explain the file allocation and access methods with their advantages and disadvantages. (CO5) 10

8-b. Consider a disk queue with requests for I/O to blocks on cylinders 98, 183, 41, 122, 14, 124, 65, 67,83. The head is initially at cylinder number 56. The cylinders are numbered from 0 to 199. What are the total distance (in cylinders) that the disk arm moves to satisfy all the pending requests, for each of the following disk-scheduling algorithms 10

i) LOOK

ii) SSTF

iii) SCAN

iv) C-SCAN (CO5)