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NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA

(An Autonomous Institute Affiliated to AKTU, Lucknow)

B.Tech

SEM: IV - THEORY EXAMINATION (2021 - 2022)

Subject: Operating Systems

Time: 3 Hours

Max. Marks: 100

General Instructions:

1. The question paper comprises three sections, A, B, and C. You are expected to answer them as directed.
2. Section A - Question No- 1 is 1 mark each & Question No- 2 carries 2 mark each.
3. Section B - Question No-3 is based on external choice carrying 6 marks each.
4. Section C - Questions No. 4-8 are within unit choice questions carrying 10 marks each.
5. No sheet should be left blank. Any written material after a blank sheet will not be evaluated/checked.

SECTION A

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1. Attempt all parts:-

- 1-a. Operating System is a/an between user and hardware of a system (CO1) 1
- (a) Interface
 - (b) input
 - (c) Output
 - (d) Processor
- 1-b. A Program in execution is known as (CO1) 1
- (a) process
 - (b) Program
 - (c) function
 - (d) procedure
- 1-c. The processes that are residing in main memory and are ready and waiting to execute are kept on a list called _____ (CO2) 1
- (a) job queue
 - (b) ready queue
 - (c) execution queue
 - (d) process queue
- 1-d. What type of scheduling is round-robin scheduling? (CO2) 1
- (a) Linear data scheduling
 - (b) Non-linear data scheduling
 - (c) Preemptive scheduling
 - (d) Non-preemptive scheduling
- 1-e. Banker's algorithm for resource allocation deals with (CO3) 1
- (a) Deadlock prevention
 - (b) Deadlock avoidance
 - (c) Deadlock recovery
 - (d) None of the above
- 1-f. Critical Section must followed by (CO3) 1
- (a) Exit Section
 - (b) Entry Section
 - (c) Remainder Section
 - (d) None of these

- 1-g. CPU fetches the instruction from memory according to the value of _____ (CO4) 1
 (a) program counter
 (b) status register
 (c) instruction register
 (d) program status word
- 1-h. Allocate the largest hole that is big enough is _____ memory allocation technique. (CO4) 1
 (a) Worst-Fit
 (b) Best-Fit
 (c) First-Fit
 (d) none of the mentioned
- 1-i. Which of the following is not a feature of Unix? (CO5) 1
 (a) multiuser
 (b) easy to use
 (c) multitasking
 (d) portability
- 1-j. I/O hardware contains _____ (CO5) 1
 (a) Bus
 (b) Controller
 (c) I/O port and its registers
 (d) All of the mentioned

2. Attempt all parts:-

- 2.a. What is the relationship between threads and processes? (CO1) 2
- 2.b. Define Swap-out and Swap-in. (CO2) 2
- 2.c. List Classical IPC problems. (CO3) 2
- 2.d. If Size of Main Memory is 16 MB and Block size is 4 KB. Find number of Blocks and bit of Physical Address. (CO4) 2
- 2.e. Why SCAN algorithm also known as Elevator Algorithm? (CO5) 2

SECTION B 30

3. Answer any five of the following:-

- 3-a. What is Time-sharing Operating System? How does it manage processes? (CO1) 6
- 3-b. What is System Call? Explain with example. (CO1) 6
- 3-c. Consider the following code segment: `pid t pid; pid = fork(); if (pid == 0) { /* child process */ fork(); thread create(. . .); } fork();` a. How many unique processes are created? b. How many unique threads are created? (CO2) 6
- 3-d. Explain Shortest Job First CPU scheduling with the help of an example. (CO2) 6
- 3-e. How does mutex protect Critical Section from race condition? (CO3) 6
- 3-f. Explain Segmentation with example. (CO4) 6
- 3.g. What is disk scheduling? Explain FCFS and SCAN disk scheduling algorithms. (CO5) 6

SECTION C 50

4. Answer any one of the following:-

- 4-a. Explain the functions of Operating System. (CO1) 10
- 4-b. Explain the features of Batch Operating System with its advantages and disadvantages. (CO1) 10

5. Answer any one of the following:-

- 5-a. Explain Round-robin CPU scheduling with an example. (CO2) 10

- 5-b. Suppose that the following processes arrive for execution at the times indicated. Each process will run for the amount of time listed. In answering the questions, use non-preemptive scheduling, and base all decisions on the information you have at the time the decision must be made. 10
- Process Arrival Time Burst Time
- P1 0.0 8
- P2 0.4 4
- P3 1.0 1
- a) What is the average turnaround time for these processes with the FCFS scheduling algorithm?
- b) What is the average turnaround time for these processes with the SJF scheduling algorithm?
- c) The SJF algorithm is supposed to improve performance, but notice that we chose to run process P1 at time 0 because we did not know that two shorter processes would arrive soon. Compute what the average turnaround time will be if the CPU is left idle for the first 1 unit and then SJF scheduling is used. Remember that processes P1 and P2 are waiting during this idle time, so their waiting time may increase. This algorithm could be known as future-knowledge scheduling (CO2)
6. Answer any one of the following:-
- 6-a. Explain Dining-Philosophers Problem and give its solution. (CO3) 10
- 6-b. What is critical section problem and what are the requirements that need to be satisfied by any solution to critical section problem? Give a solution to a 2 process critical section problem. (CO3) 10
7. Answer any one of the following:-
- 7-a. Explain the difference between Internal and External Fragmentation with example. (CO4) 10
- 7-b. Consider the reference stream 1,2,3,4,2,1,5,6,2,1,2,3,7,6,3,2,1,2,3,6. How many page faults while using FCFS and LRU using 2 frames? (CO4) 10
8. Answer any one of the following:-
- 8-a. Explain the features of UNIX in details. (CO5) 10
- 8-b. Write a Shell Script which works as a calculator and performs Addition, Subtraction, Division and Multiplication operations. (CO5) 10