SASTRA

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School of Computing
First CIA Exam –Feb 2024
Course Code: CSE308
Course Name: OPERATING SYSTEMS
Duration: 90 minutes   Max Marks: 50

PART A

Answer all the questions   10 X 2 =20

1. State the advantage of accessing system calls through API
2. List the information contained in a PCB and its role in context switching
3. Justify the role of long term scheduler in maintaining the CPU's performance
4. What happens when a parent process issue a wait() system call and what happens if the parent fails to issue a wait() system call ?
5. Between shared memory and message queue, which one is better to reduce number of mode switches involved and why?
6. Mention the characteristics of an ordinary pipe with its syntax and parameters
7. How many processes get created if the following code is executed?
   If(fork() || fork())
           fork();
8. Write the formula used for predicting the burst time using exponential average and mention the three possible ways its prediction can be controlled.
9. Calculate the number of context switches involved in scheduling of the following processes under preemptive SJF

	P1	P2	P3	P4	P5	P6
AT	0	2	4	6	7	9
BT	5	2	3	4	6	3

10. Prove with an example that preemptive algorithms may lead to race conditions

PART B

11. Calculate the turn-around times and waiting times of the following processes using the SJF algorithm. Note that you should consider the BT1 of processes which are yet to commence the first turn of execution and should consider BT2 of processes which have completed IO, for the selection of shortest processes.

	P1	P2	P3	P4	P5
AT	2	3	5	6	8
BT1	4	6	9	4	6
IO	4	3	5	4	3
BT2	2	4	5	2	3

12. Discuss the concept of system calls with the role API, parameter passing methods and types of system calls (7). Identify the system calls invoked during the execution of the program for the creation of parent-child processes and communication between them(3)

13. Find the waiting time of processes using Multi-level feedback queue scheduling with three queues having the time quantum of 2,4 and 6 respectively

	P1	P2	P3	P4	P5
AT	0	2	6	7	9
BT	3	8	6	11	9

PART A (2 * 10 = 20) Answer all the questions

1. Consider the following program execution involving 2 threads accessing the shared variable 'i' = 0.

   Thread1   Thread2
   i++;   i++;
   while(i<2);   while(i<2);

   Which of the following statement(s) is/are correct? justify .

   A. Both threads will never finish execution
   B. Both threads will always finish execution
   C. At least one of the threads will always finish execution
   D. Either both threads will finish, or none of them of will finish execution

2. Mention the syntax of pthread_create and pthread_join

3. Define target thread and mention the two scenarios how it can be cancelled

4. Specify any two programming examples to claim multithreading provides better performance than a single-threaded solution.

5. Relate strong semaphore and the need for spinlock.

6. Define monitor and mention its use.

7. Is mutual exclusion guaranteed in counting semaphore state yes or no then justify.

8. Consider a non negative semaphore S. 20P(S) and 14 V(S)operations are performed on S in some order, where P(S) decrements S and V(S) increments. Estimate the largest initial value of S that will keep at least one process blocked.

9. Consider a system having m resources of the same type. These resources are shared by 3 processes A, B and C which have peak demands of 3, 4 and 6 respectively. For what value of m, deadlock will not occur?

10. Consider the following threads, T1, T2 and T3 executing on a single processor, synchronized using three binary semaphore variables, S1, S2 and S3, operated upon using standard wait( ) and signal( ). The threads can be context switched in any order and at any time.

T1	T2	T3
while(true)	while(true)	while(true)
{ wait(S3)	{ wait(S1)	{ wait(S2)
print("C")	print("B")	print("A")
signal(S2) }	signal(S3) }	signal(S1) }

Find the initial value of S1,S2,S3 that would print the sequence BCABCABCA....... ?

PART B (3 * 10 = 30) Answer any three questions

11. Develop the structure of the reader and writer process to achieve synchronization between multiple readers and writers. Mention the challenge posed on writers by allowing concurrent readers and how it can be resolved.

12. Elaborate multithreading models and highlight the benefits of multithreaded programming.

13. Consider a system of 6 process P0 to P5 using 4 types of resources A,B,C and D as 15,6, 9,10 instances of each type respectively. For the given allocation and maximum matrix determine safe allocation is possible. If so mention the safe sequence.

	Current Allocation				Maximum Need			
	A	B	C	D	A	B	C	D
P0	2	0	2	1	9	5	5	5
P1	0	1	1	1	2	2	3	3
P2	4	1	0	2	7	5	4	4
P3	1	0	0	1	3	3	3	2
P4	1	1	0	0	5	2	2	1
P5	1	0	1	1	4	4	4	4

14. With reference to the above question no. 13, determine whether a new request from P5 with (3,2,3,3) instances from each type can be accepted. If it is possible, generate the safe sequence otherwise estimate the minimum no of additional instances required from each type to handle a deadlock free execution.

School of Computing
ThirdCIA Exam – April 2024
Course Code: CSE308
Course Name: Operating Systems
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PART - A

Answer all the questions   **5 X 2 = 10**

1. How does an interrupt differ from a trap?
2. A process executes the following code.
   for (i = 0; i< n; i++) fork ();
   How many child processes are created?
3. Name two hardware instructions and their definitions that can be used for implementingmutual exclusion.
4. How the problem of external fragmentation can be solved?
5. Calculate the number of pages for the process of size 72,766 bytes and thepage size is 2,048 bytes. Does internal fragment occur? If yes, how? If no, why?

PART- B

Answer Any Three Questions   **3 X 10 = 30**

6. Consider the following set of processes, whose arrival and execution time, is given below.

Process	Arrival Time	Exec. Time
P1	0.0	7
P2	2.0	4
P3	4.0	1
P4	5.0	4

(a) With pre-emptive SJF algorithm find average waiting time and average turnaround time.   (4)
(b) With Round Robin algorithm [Time Quantum=2] find average waiting time and average turnaround time.   (4)
(c) Compare two algorithms and conclude which one is best and why?   (2)

7. Given page reference string: 1,2,3,4,2,1,5,6,2,1,2,3,7,6,3,2,1,2,3,6 with four frames. Compare the number of page faults for LRU and Optimal page replacement algorithm.

8. Discuss : Segmentation.

9. With neat diagram, explain three major methods of allocating disk space.

PART – C

Answer the following Question   1 X 10 = 10

10. a) Assume a disk with 200 tracks numbered 0 to 199. Initially the read/write head is on 100. The queue of the pending request is kept in the order 55, 58, 39, 18, 90, 160, 150, 38 and 184. With diagram showing the head movement calculate the average seek length for the following disk scheduling algorithm.
   i) FIFO   ii) SSTF   iii) C-SCAN