Qn. Set Code-7 (SOT)

Semester: 4th
Programme: B.Tech
Branch: CSE, IT, CSCE, CSSE

SPRING END SEMESTER EXAMINATION-2024

4th Semester B.Tech

OPERATING SYSTEMS

CM20002 / CS20002 / CS 2002 / IT20002/ CC20002

(For 2022 & Previous Admitted Batches)

Time: 2 Hours 30 Minutes | Full Marks: 50

Answer any FIVE questions.
Question paper consists of two SECTIONS i.e. A and B.
Section A is compulsory.
Attempt any Four question from Sections B.
The figures in the margin indicate full marks.
Candidates are required to give their answers in their own words as far as practicable and all parts of a question should be answered at one place only.

SECTION-A

1. Answer the following questions: [1 × 10]

   (a) Differentiate between Serial Processing OS and Batch Processing OS.

   (b) If time slice size is of 3 units of time and only one process with 14 burst time is there in the ready queue, and RR CPU scheduling algorithm is applied, then what will be the number of context switches?

   (c) A process executes the following segment of code: for(i=1; i<5; i++) fork();

   How many child processes will be created?

   (d) CPU generates a logical address as 0x00f3 whose physical address is 0xff15. Find out the starting segment address of the segment and offset, if 8bits are used for the offset.

   (e) At present, the value of a counting semaphore is 7. If 20 P( ) operations and X number of V( ) operations are performed leading to a final value of 5 for the counting semaphore. Find the value X.

(f) Highlight the advantages of acyclic graph structured directory.

(g) A system has 6 identical resources and N processes competing for them. Each process can request atmost 2 resources. For what values of N will the system lead to a Deadlock?

(h) Justify whether it is possible to have a deadlock with one process only.

(i) Compare between Device controllers and Device drivers.

(j) "It is better to dispatch shorter processes first while scheduling." Justify.

SECTION-B

2. (a) Consider the following scheduling scenario. Processes are allocated CPU in round robin fashion, according to the given priority (lower the number higher the priority), for a time quantum of 5 units only for one time. After this, processes are arranged in increasing order of their remaining CPU burst time in the ready queue. New priorities are assigned according to the remaining CPU bursts time of the processes that is, process with shortest remaining CPU burst time is assigned with highest priority. The processes are now executed according to the new priorities and each process gets the control of the CPU until they finished their execution. With Draw the Gantt chart, and find the number of context switches, waiting time of each process. [7]

P ID	CPU Burst	Priority
A	22	4
B	18	2
C	9	1
D	10	3
E	4	5

(b) A shared variable D is 100 initially. A process P1 increases D by 20, process P2 reduces D by 50, process C increases D by 10. Find the Minimum and Maximum value of D after the execution of the three processes. [3]

3. (a) In the memory, four partitions are of sizes 4KB, 8KB, 20KB and 2KB (in order) respectively. Total 7 processes arrive at time 0 with memory request size (in Bytes) and usage time (in ms) as given in the following table: [7]

Req No	P1	P2	P3	P4	P5	P6	P7
Req Size	2	14	3	6	6	10	7
Use Time	4	10	2	8	4	1	8

Calculate the time at which process P7 will be completed if the Best fit method is used for fixed sized partitioned memory.

(b) Write short notes on any one of the following [3]

i. Thrashing

ii. Inverted Page Table

4. (a) Consider the following snapshot of resource allocation of a system. [7]

PID	Allocation				Max Need			
	E	F	G	H	E	F	G	H
P1	0	0	1	2	0	0	1	2
P2	1	0	0	0	1	7	5	0
P3	1	3	5	4	2	3	5	6
P4	0	6	3	2	0	6	5	2
P5	0	0	1	4	0	6	5	6

Resource type E has 3 instances, F has 14 instances, G has 12 instances and H has 12 instances.

Answer the following questions using banker's algorithm.

I. What is the content of the Need matrix?

II. Find if the system is in a safe state by demonstrating an order in which the processes may complete.

If a request from process P4 arrives for (0,4,2,0) can the request be granted immediately?

(b) Explain the deadlock recovery mechanism. [3]

5. (a) A disk has 200 cylinders numbered from 0 to 199. The drive is currently serving a request at cylinder 53 and the previous request was at cylinder 25. The pending request queue is 98, 183, 37, 122, 14, 124, 65, 67. Starting from the current head position, the total distance the disk arm moves to satisfy all the pending requests for SSTF Disk Scheduling Algorithm is X cylinders. Similarly, the total distance the disk arm moves to satisfy all the pending requests for C-SCAN Disk Scheduling Algorithm is Y cylinders, find X + Y. [6]

(b) Explain the steps along with the data structures required to be referred for a close( ) system call to close a file. [4]

6. (a) What is the role of an *inode*? Describe the structure of *inode* in UNIX. [6]

(b) Explain any two file allocation methods and compare them in terms of space and time. [4]

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