[No. of Printed Pages – 8] **1533**

CSE202 Enrol. No. 579.....
[ET]

END SEMESTER EXAMINATION : APRIL-MAY, 2024

OPERATING SYSTEM

Time : 3 Hrs. *Maximum Marks : 60*

Note: ***Attempt questions from all sections as directed.***

SECTION – A (24 Marks)

Attempt any **four** *questions out of* **five.**

Each question carries **06** *marks.*

(6)

1. (a) Some CPUs provide for more than two modes of operation, what are these two modes and uses of these multiple mode? (3)

(b) What is the cause of thrashing? How does the system detect thrashing? Once it detects thrashing, what can the system do to eliminate this problem? (3)

P.T.O.

2. What is the purpose of system calls?, How is it different form system program? What system calls have to be executed by a command interpreter or shell in order to start a new process on a UNIX system?

3. Consider the following snapshot of a system:

	Allocation	*Max*
	A B C D	*A B C D*
T_0	3 0 1 4	5 1 1 7
T_1	2 2 1 0	3 2 1 1
T_2	3 1 2 1	3 3 2 1
T_3	0 5 1 0	4 6 1 2
T_4	4 2 1 2	6 3 2 5

Using the banker's algorithm, determine whether or not each of the following states is unsafe. If the state is safe, illustrate the order in which the threads may complete. Otherwise, illustrate why the state is unsafe.
a. Available = (0, 3, 0, 1) b. Available = (1, 0, 0, 2)

4. What is DMA, Explain in detail. How does DMA increase system concurrency? How does it complicate hardware design?

5. What are threads, What are two differences between user-level threads and kernel-level threads? Under what circumstances is one type better than the other?

SECTION – B (20 Marks)

Attempt any **two** *questions out of* **three.**
Each question carries **10** *marks.*

6. (a) A page-replacement algorithm should minimize the number of page faults. We can do this minimization by distributing heavily used pages evenly over all of memory, rather than having them compete for a small number of page frames. We can associate with each page frame a counter of the number of pages that are associated with that frame. Then, to replace a page, we search for the page frame with the smallest counter.

(3)

(a) Define a page-replacement algorithm using this basic idea. Specifically address the problems of (1) what the initial value of the counters is, (2) when counters are increased, (3) when counters are decreased, and (4) how the page to be replaced is selected.

(b) How many page faults occur for your algorithm for the following reference string, for four page frames? 1, 2, 3, 4, 5, 3, 4, 1, 6, 7, 8, 7, 8, 9, 7, 8, 9, 5, 4, 5, 4, 2.

(c) What is the minimum number of page faults for an optimal pagereplacement strategy for the reference string in part b with four page frames? (6)

(b) Differentiate between Logical and Physical address, Consider a logical address space of 256 pages with a 4-KB page size, mapped onto a physical memory of 64 frames.

(a) How many bits are required in the logical address?

(b) How many bits are required in the physical address? (4)

7. (a) Which is the best interfacing of IO with the CPU? Give answer while keeping the following parameters in mind:-

(1) Accuracy

(2) Speed

1533

(3) Time Consumption

(4)

(b) consider a storage disk with 4 platters (numbered as 0, 1, 2 and 3), 200 cylinders (numbered as 0, 1, ... , 199), and 256 sectors per track (numbered as 0, 1, . 255). The following 6 disk requests of the form [sector number, cylinder number, platter number] are received by the disk controller at the same time: [120, 72, 2], [180, 134, 1], [60, 20, 0], [212, 86, 3], [56, 116, 2], [118, 16, 1] Currently head is positioned at sector number 100 of cylinder 80, and is moving towards higher cylinder numbers. The average power dissipation in moving the head over 100 cylinders is 20 milliwatts and for reversing the direction of the head movement once is 15 milliwatts. Power dissipation associated with rotational latency and switching of head between different platters is negligible. Find the total power consumption in milliwatts to satisfy all of the above disk requests using the Shortest Seek Time First disk scheduling algorithm. (6)

P.T.O.

8. (a) Consider a system consisting of processes Pl, P 2, ..., Pn, each of which has a unique priority number. Write a monitor that allocates three identical line printers to these processes, using the priority numbers for deciding the order of allocation. (6)

(b) In a multiprogramming and time-sharing environment, several users share the system simultaneously. This situation can result in various security problems.

(a) What are two such problems?

(b) Can we ensure the same degree of security in a time-shared machine as in a dedicated machine? Explain your answer (4)

SECTION – C (16 Marks)

(Compulsory)

9. (a) Consider the following set of processes, assumed to have arrived at time 0. Consider the CPU scheduling algorithms Shortest Job First (SJF) and Round Robin (RR). For RR, assume that the

processes are scheduled in the order P1, P2, P3, P4.

Processes	P_1	P_2	P_3	P_4
Burst time (in ms)	8	7	2	4

If the time quantum for RR is 4 ms, then

(i) Make the gant chart for both RR and SJF

(ii) Find the absolute value of the difference between the average turnaround times (in ms) of SJF and RR

(iii) find the completion time and response time for both the methods (9)

(b) The following C program is executed on a Unix/ Linux system :

```
1. #include<unistd.h>
2. int main()
3. {
4. int i;
5. for(i=0; i<10; i++)
6. if(i%2==0)
7. fork();
8. return0;}
```

find the total number of child processes created, Explain in detail. (4)

(c) Buffer-overflow attacks can be avoided by adopting a better programming methodology or by using special hardware support. Discuss these solutions. (3)