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CSE202

Enrol. No.

[ET]

SUPPLEMENTARY EXAMINATION : JUNE 2022

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.

1. List five services provided by an operating system that are designed to make it more convenient for users to use the computer system.
2. Illustrate the functioning of virtual memory and explain how it is obtained by demand paging. In the demand paging memory, a page table is held in registers. If it takes 1000 ms to service a page fault and if the memory access time is 10 ms, what is the effective access time for a pagefault rate of 0.01?
3. Discuss the need of system calls. Also discuss the system calls related to process control and communication in brief.

P.T.O.

4. Describe buffering in the I/O subsystem of an operating system. Give reasons why it is required, and give a case where it is an advantage, and a case where it is a disadvantage.

5. Explain the purpose of interrupts. Differentiate between a trap and an interrupt. Can traps be generated intentionally by a user program? If so, for what purpose?

SECTION – B (20 Marks)

Attempt any two questions out of three.

Each question carries 10 marks.

6. Define Producer Consumer problem in detail with bounded buffer. How it can illustrate the classical problem of synchronization? Explain. Also provide solution of this problem with the help of semaphore.

7. Suppose that a disk drive has 5000 cylinders, numbered 0 to 4999. The drive is currently serving a request at cylinder 143, and the previous request was at cylinder 125. The queue of pending requests, in FIFO order, is

86, 1470, 913, 1774, 948, 1509, 1022, 1750, 130

Starting from the current head position, what is the total distance (in cylinders) that the disk arm moves

(SE10)

to satisfy all the pending requests, for each of the following disk- scheduling algorithms?

- (a) FCFS
- (b) SSTF
- (c) SCAN
- (d) C-SCAN

8. (a) Discuss the influence of non-contiguous allocation of disk sapce on the feasibility and effectiveness of the fundamental file organizations. (5)

- (b) Define Belady's anomaly in FIFO page replacement algorithm. Consider the following page reference string

1, 2, 3, 4, 2, 1, 5, 6, 2, 1, 2, 3, 7, 6, 3, 2, 1, 2, 3, 6.

Compare the number of page faults with frame sizes 3 with FIFO and LRU replacement algorithm. (5)

SECTION – C (16 Marks)

(Compulsory)

9. (a) Describe the Banker's algorithm for safe allocation
Consider the following snapshot of a system:

P.T.O.

(SE10)



| | Allocation | Max | Available |
|----------------|------------|---------|-----------|
| | A B C D | A B C D | A B C D |
| P ₀ | 0 0 1 2 | 0 0 1 2 | 1 5 2 0 |
| P ₁ | 1 0 0 0 | 1 7 5 0 | |
| P ₂ | 1 3 5 4 | 2 3 5 6 | |
| P ₃ | 0 6 3 2 | 0 6 5 2 | |
| P ₄ | 0 0 1 4 | 0 6 5 6 | |

- (i) What is the content of the matrix Need?
(ii) Is the system in a safe state?
(iii) If a request from process P1 arrives for (0,4,2,0), can the request be granted immediately? (10)

(b) Consider a paging system with the page table stored in memory.

- (i) If a memory reference takes 200 nanoseconds, how long does a paged memory reference take?
(ii) If we add associative registers, and 75 percent of all page-table references are found in the associative registers, what is the effective memory reference time? (Assume that finding a page-table entry in the associative registers takes zero time, if the entry is there.) (6)

(SE10)

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- Illustrate the functioning of virtual memory and explain how it is obtained by demand paging. In the demand paging memory, a page table is held in registers. If it takes 1000 ms to service a page fault and if the memory access time is 10 ms, what is the effective access time for a pagefault rate of 0.01?
- Discuss the need of system calls. Also discuss the system calls related to process control and communication in brief.

P.T.O.

(SE10)



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4. Describe buffering in the I/O subsystem of an operating system. Give reasons why it is required, and give a case where it is an advantage, and a case where it is a disadvantage.
5. Explain the purpose of interrupts. Differentiate between a trap and an interrupt. Can traps be generated intentionally by a user program? If so, for what purpose?

SECTION – B (20 Marks)

Attempt any two questions out of three.

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6. Define Producer Consumer problem in detail with bounded buffer. How it can illustrate the classical problem of synchronization? Explain. Also provide solution of this problem with the help of semaphore.
7. Suppose that a disk drive has 5000 cylinders, numbered 0 to 4999. The drive is currently serving a request at cylinder 143, and the previous request was at cylinder 125. The queue of pending requests, in FIFO order, is

86, 1470, 913, 1774, 948, 1509, 1022, 1750, 130

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(SE10)

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- (d) C-SCAN

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1, 2, 3, 4, 2, 1, 5, 6, 2, 1, 2, 3, 7, 6, 3, 2, 1, 2, 3, 6.

Compare the number of page faults with frame sizes 3 with FIFO and LRU replacement algorithm. (5)

SECTION – C (16 Marks)
(Compulsory)

9. (a) Describe the Banker's algorithm for safe allocation
Consider the following snapshot of a system:

P.T.O.

(SE10)

| | Allocation | Max | Available |
|----------------|------------|---------|-----------|
| | A B C D | A B C D | A B C D |
| P ₀ | 0 0 1 2 | 0 0 1 2 | 1 5 2 0 |
| P ₁ | 1 0 0 0 | 1 7 5 0 | |
| P ₂ | 1 3 5 4 | 2 3 5 6 | |
| P ₃ | 0 6 3 2 | 0 6 5 2 | |
| P ₄ | 0 0 1 4 | 0 6 5 6 | |

(i) What is the content of the matrix Need?

(ii) Is the system in a safe state?

(iii) If a request from process P₁ arrives for (0,4,2,0), can the request be granted immediately? (10)

(b) Consider a paging system with the page table stored in memory.

(i) If a memory reference takes 200 nanoseconds, how long does a paged memory reference take?

(ii) If we add associative registers, and 75 percent of all page-table references are found in the associative registers, what is the effective memory reference time? (Assume that finding a page-table entry in the associative registers takes zero time, if the entry is there.) (6)

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Enrol. No.

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ND SEMESTER EXAMINATION: APRIL-MAY 2022

OPERATING SYSTEM

ne : 3 Hrs.

Maximum Marks : 60

ote: Attempt questions from all sections as directed.

Use of scientific Calculator is allowed

SECTION - A (24 Marks)

Attempt any four questions out of five.

Each question carries 06 marks.

1. Describe the difference between symmetric and asymmetric multiprocessing. What are the three advantages and one disadvantages of multiprocessor systems?
2. “Priority inversion is a condition that occurs in real time systems where a low priority process is starved because higher priority processes have gained hold of the CPU” – Comment on this statement.
3. When multiple interrupts from different devices appear at about the same time, a priority scheme could be used to determine the order in which the interrupts

P.T.O.

(921)

would be serviced. Discuss what issues need to be considered in assigning priorities to different interrupts.

4. In a multiprogramming and time-sharing environment, several users share the system simultaneously. The situation can result in various security problems.

(i) What are two such problems?

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

Define authentication? Why simple password protection is the most common authentication scheme in use today? Discuss the weakness inherent in the password protection scheme.

SECTION - B (20 Marks)

Attempt any two questions out of three.

Each question carries 10 marks.

- a) Explain race condition and show how a critical section avoids this condition. List down the properties which a data items should possess to implement a critical section? Describe a solution to the Dining philosopher problem so that no races arise. (5)

(921)

- (b) Let a disk drive has 5000 cylinders from 0 to 4999. Currently drive is at 143rd cylinder, and the previous request was at cylinder 125. Queue of pending request in FIFO order I 86, 1470, 913, 1774, 948, 1509, 1022, 130. What is the total distance the disk arm moves to satisfy all the pending requests for LOOK disk scheduling algorithms from current position? (5)

7. Consider a file system where a file can be deleted and its disk space reclaimed while links to that file still exist. What problems may occur if a new file is created in the same storage area or with the same absolute path name? How can these problems be avoided?

8. Consider the following reference string : 1,2,3,4,2, 1,5,6,2,1,2,3,7,6,3,2,1,2,3,6. How many page faults would occur for the following replacement algorithms assuming three frames? Remember that frame is initially empty.

- (i) FIFO replacement
- (ii) LRU replacement
- (iii) MFU replacement
- (iv) Optimal replacement

P.T.O.

(921)

SECTION - C*(Compulsory)*

(16 Marks)

9. (a) Consider the following snapshot of a system. P₀, P₁, P₂, P₃, P₄ are the processes and A, B, C, D are the resource types.

| Process | Max Matrix A B C D | | | | Allocation Matrix A B C D | Available Matrix A B C D |
|----------------|-----------------------|---|---|---|------------------------------|-----------------------------|
| | 4 | 0 | 0 | 1 | | |
| P ₀ | 6 | 0 | 1 | 2 | | 3 |
| P ₁ | 1 | 7 | 5 | 0 | 1 | 1 |
| P ₂ | 2 | 3 | 5 | 6 | 1 | 2 |
| P ₃ | 1 | 6 | 5 | 3 | 0 | 6 |
| P ₄ | 1 | 6 | 5 | 6 | 0 | 2 |

Using Banker's algorithm, answer the following questions :

How many resources of type A, B, C and D are there?

What are the contents of the need matrix?

Is the system in a safe state? Why?

If a request from P₄ arrives for additional resources of (1, 2, 0, 0) can the Banker's algorithm grant the request immediately? Show the new system state and other criteria. (8)

- (b) Compare the main memory organization schemes of contiguous-memory allocation, pure segmentation, and pure paging with respect to the following issues :

(i) External Fragmentation

(ii) Internal Fragmentation

(8)

(1000)

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END SEMESTER EXAMINATION : APRIL-MAY 2022

OPERATING SYSTEM

Time : 3 Hrs.

Maximum Marks : 60

Note: Attempt questions from all sections as directed.

Use of scientific Calculator is allowed

SECTION - A (24 Marks)

Attempt any four questions out of five.

Each question carries 06 marks.

- Describe the difference between symmetric and asymmetric multiprocessing. What are the three advantages and one disadvantages of multiprocessor systems?
- "Priority inversion is a condition that occurs in real time systems where a low priority process is starved because higher priority processes have gained hold of the CPU" – Comment on this statement.
- When multiple interrupts from different devices appear at about the same time, a priority scheme could be used to determine the order in which the interrupts

P.T.O.

(921)

(921)



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would be serviced. Discuss what issues need to be considered in assigning priorities to different interrupts.

4. In a multiprogramming and time-sharing environment, several users share the system simultaneously. The situation can result in various security problems.
 - (i) What are two such problems?
 - (ii) Can we ensure the same degree of security in a time-shared machine as in a dedicated machine? Explain your answer.
5. Define authentication? Why simple password protection is the most common authentication scheme in use today? Discuss the weakness inherent in the password protection scheme.

SECTION - B (20 Marks)

Attempt any two questions out of three.

Each question carries 10 marks.

6. (a) Explain race condition and show how a critical section avoids this condition. List down the properties which a data items should possess to implement a critical section? Describe a solution to the Dining philosopher problem so that no races arise. (5)

(921)

- (b) Let a disk drive has 5000 cylinders from 0 to 4999. Currently drive is at 143rd cylinder, and the previous request was at cylinder 125. Queue of pending request in FIFO order I 86, 1470, 913, 1774, 948, 1509, 1022, 130. What is the total distance the disk arm moves to satisfy all the pending requests for LOOK disk scheduling algorithms from current position? (5)
7. Consider a file system where a file can be deleted and its disk space reclaimed while links to that file still exist. What problems may occur if a new file is created in the same storage area or with the same absolute path name? How can these problems be avoided?
8. Consider the following reference string : 1,2,3,4,2, 1,5,6,2,1,2,3,7,6,3,2,1,2,3,6. How many page faults would occur for the following replacement algorithms assuming three frames? Remember that frame is initially empty.
 - (i) FIFO replacement
 - (ii) LRU replacement
 - (iii) MFU replacement
 - (iv) Optimal replacement

P.T.O.

(921)

SECTION - C
(Compulsory)

(16 Marks)

9. (a) Consider the following snapshot of a system. P₀, P₁, P₂, P₃, P₄ are the processes and A, B, C, D are the resource types.

| Process | Max Matrix A B C D | | | | Allocation Matrix A B C D | | | | Available Matrix A B C D | | | |
|----------------|-----------------------|---|---|---|------------------------------|---|---|---|-----------------------------|---|---|---|
| | 6 | 0 | 1 | 2 | .4 | 0 | 0 | 1 | 3 | 2 | 1 | 1 |
| P ₀ | 1 | 7 | 5 | 0 | | 1 | 1 | 0 | | | | |
| P ₁ | 2 | 3 | 5 | 6 | | 1 | 2 | 5 | 4 | | | |
| P ₂ | 1 | 6 | 5 | 3 | | 0 | 6 | 3 | 3 | | | |
| P ₃ | 1 | 6 | 5 | 6 | | 0 | 2 | 1 | 2 | | | |
| P ₄ | | | | | | | | | | | | |

Using Banker's algorithm, answer the following questions :

How many resources of type A, B, C and D are there?

What are the contents of the need matrix?

Is the system is in a safe state? Why?

If a request from P₄ arrives for additional resources of (1, 2, 0, 0) can the Banker's algorithm grant the request immediately? Show the new system state and other criteria. (8)

(b) Compare the main memory organization schemes of contiguous-memory allocation, pure segmentation, and pure paging with respect to the following issues :

(i) External Fragmentation

(ii) Internal Fragmentation

(8)

(1000)

CSE202

Enrol. No.

[ET]

END SEMESTER EXAMINATION : April-May, 2023

OPERATING SYSTEM

Time : 3 Hrs.

Maximum Marks : 60

Note: Attempt questions from all sections as directed.

Use of Scientific calculator is allowed.

SECTION - A (24 Marks)

Attempt any four questions out of five.

Each question carries 06 marks.

1. (a) How does the distinction between kernel mode and user mode function as a rudimentary form of system protection. (3)

- (b) During the life time of a process, it operates in one of the two modes, user mode and supervisor mode. For the following segment of a high-level language program, briefly describe what happens during its execution, as far as interrupt, trap and execution mode are concerned,

P.T.O.

int i,j;

2

...

i = i + 1;

WriteToScreen(i);

ReadFromKeyboard(j);

i=j+1;

2. Describe a mechanism for enforcing memory protection in order to prevent a program from modifying the memory associated with other programs. (3)
3. (a) Explain the possible ways to structure directories. (3)

 (b) What are the various steps taken by operating system to handle page fault? (3)
4. Compare the various memory allocation techniques used by operating system.
5. (a) In a paging scheme, 16-bit address are used with a page size of 512 bytes, if the logical address is 0000010001111101, how many bits are used for the page number and offset ? Compute the page number and offset as well. What will be the physical address, if the frame address corresponding to the computed page number is 15. (3)

(b) Compare the different ways to structure the page table. (3)

SECTION - B (20 Marks)

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

6. (a) Consider a set of 5 processes whose arrival time, CPU Times needed are given below :

| Process | CPU Time | Arrival Time | Priority |
|---------|----------|--------------|----------|
| P1 | 10 | 0 | 5 |
| P2 | 5 | 0 | 2 |
| P3 | 3 | 2 | 1 |
| P4 | 20 | 5 | 4 |
| P5 | 2 | 10 | 3 |

Calculate Average Waiting Time and Turn Around Time for Non-preemptive SJF, Pre-Emptive Priority and Round Robin (Time Quantum=4) (6)

- (b) A system is having 3 user processes P1, P2 and P3 where P1 requires 2 units of resource R, P2 requires 3 units of resource R, P3 requires 4 units of resource R. What is the minimum number of units of R that ensures no deadlock? How deadlock is different from starvation? How deadlock can be prevented? (4)

P.T.O.

7. Suppose that a disk has 100 cylinders, numbered 0 to 99. The drive is currently serving a request at cylinder 40 and the disk arm is moving towards 0. The queue of pending request is : 80, 35, 70, 55, 85, 30, 50, starting from the current head position, what is the total distance (in cylinders) that the disk arm moves to satisfy all the pending request for FCFS, SSTF, SCAN, C-SCAN, LOOK disk scheduling algorithm? Is disk scheduling, other than FCFS scheduling, useful in a single-user environment?

8. (a) Consider the virtual page reference string 1,2,3,2,4,1,3,2,4,1. On a demand paged virtual memory system running on a computer system that main memory size of 3 pages frames which are initially empty. Calculate page fault for FIFO, LRU, Optimal Page replacement algorithm. (5)
- (b) What are the various ways to transfer data to or from I/O devices? (5)

SECTION - C (16 Marks)
(Compulsory)

9. (a) Suppose you are designing an operating system. Discuss and compare the various free space management techniques could be used to handle free disk space. (5)

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(b) Consider a system that supports the strategies of contiguous, linked, and indexed allocation. What criteria should be used in deciding which strategy is best utilized for a particular file? (6)

(c) Consider the following snapshot of a system: (5)

| | Allocation | | | | Max | | | | Available | | | |
|----|------------|---|---|---|-----|---|---|---|-----------|---|---|---|
| | A | B | C | D | A | B | C | D | A | B | C | D |
| T0 | 3 | 1 | 4 | 1 | 6 | 4 | 7 | 3 | 2 | 2 | 2 | 4 |
| T1 | 2 | 1 | 0 | 2 | 4 | 2 | 3 | 2 | | | | |
| T2 | 2 | 4 | 1 | 3 | 2 | 5 | 3 | 3 | | | | |
| T3 | 4 | 1 | 1 | 0 | 6 | 3 | 3 | 2 | | | | |
| T4 | 2 | 2 | 2 | 1 | 5 | 6 | 7 | 5 | | | | |

Answer the following questions using the banker's algorithm :

- (i) Illustrate that the system is in a safe state by demonstrating an order in which the threads may complete.
- (ii) If a request from thread T4 arrives for (2, 2, 2, 4), can the request be granted immediately?

P.T.O.

Q&A

(b) If a request from someone to witness the
Q. L. L. Q. can take action to prevent the
immediately?

The witness from witness to witness the
Q. L. L. Q. can take action to prevent the
immediately?



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