Generated Exam

Subject: DCCN / Networks

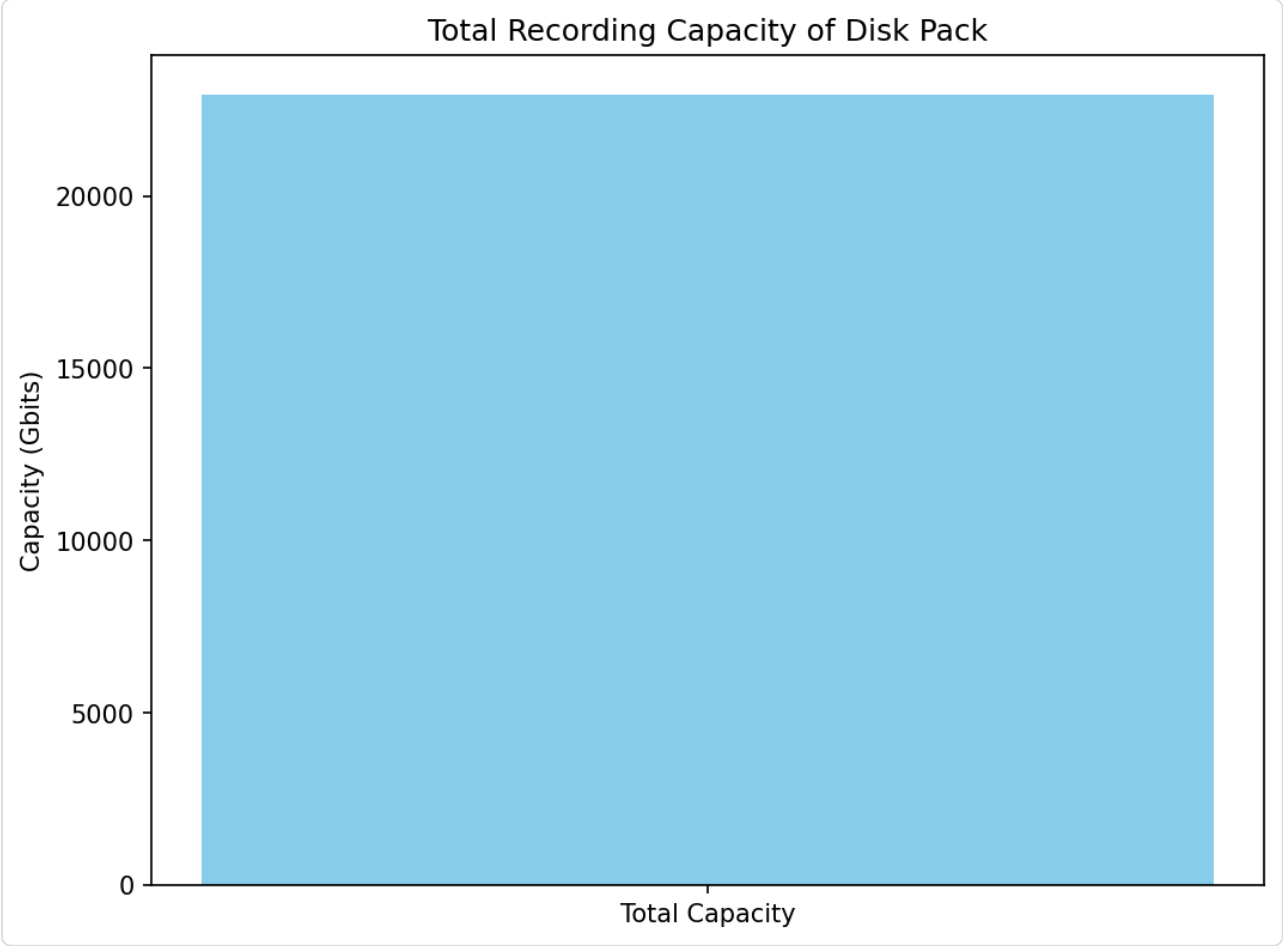
Question 1

Marks:

Question 2

A disk pack has 19 surfaces with outer diameter 22 cm and inner diameter 10 cm. The minimum track spacing is 0.25 mm. Calculate the total recording capacity of the disk pack if the maximum recording density is 1 Gbit per track inch.

This diagram illustrates the calculation of the total recording capacity of the disk pack based on the given parameters. *(Generated using matplotlib)*



Marks: 5

Question 3

Consider a system with a counting semaphore initialized to 5. Each process that wishes to access a shared resource performs a wait() operation on the semaphore, and upon releasing the resource, performs a signal() operation. If 3 processes are currently using the resource and another process attempts to access it, what will happen? Explain the behavior of the semaphore in this scenario.

Marks: 5

Question 4

Calculate the total recording capacity of a disk pack with 19 surfaces, an outer diameter of 22 cm, and an inner diameter of 10 cm if the maximum recording density is 1 Gbit per track inch, and the spacing between tracks is 0.25 mm.

Marks: 3

Question 5

Explain how the TestAndSet hardware primitive can be used for synchronization in a multithreaded program. Consider a scenario where two threads, T1 and T2, are accessing a shared resource. If T1 uses TestAndSet to lock the resource, how can T2 ensure it waits until T1 releases the resource before accessing it?

Marks: 3

Question 6

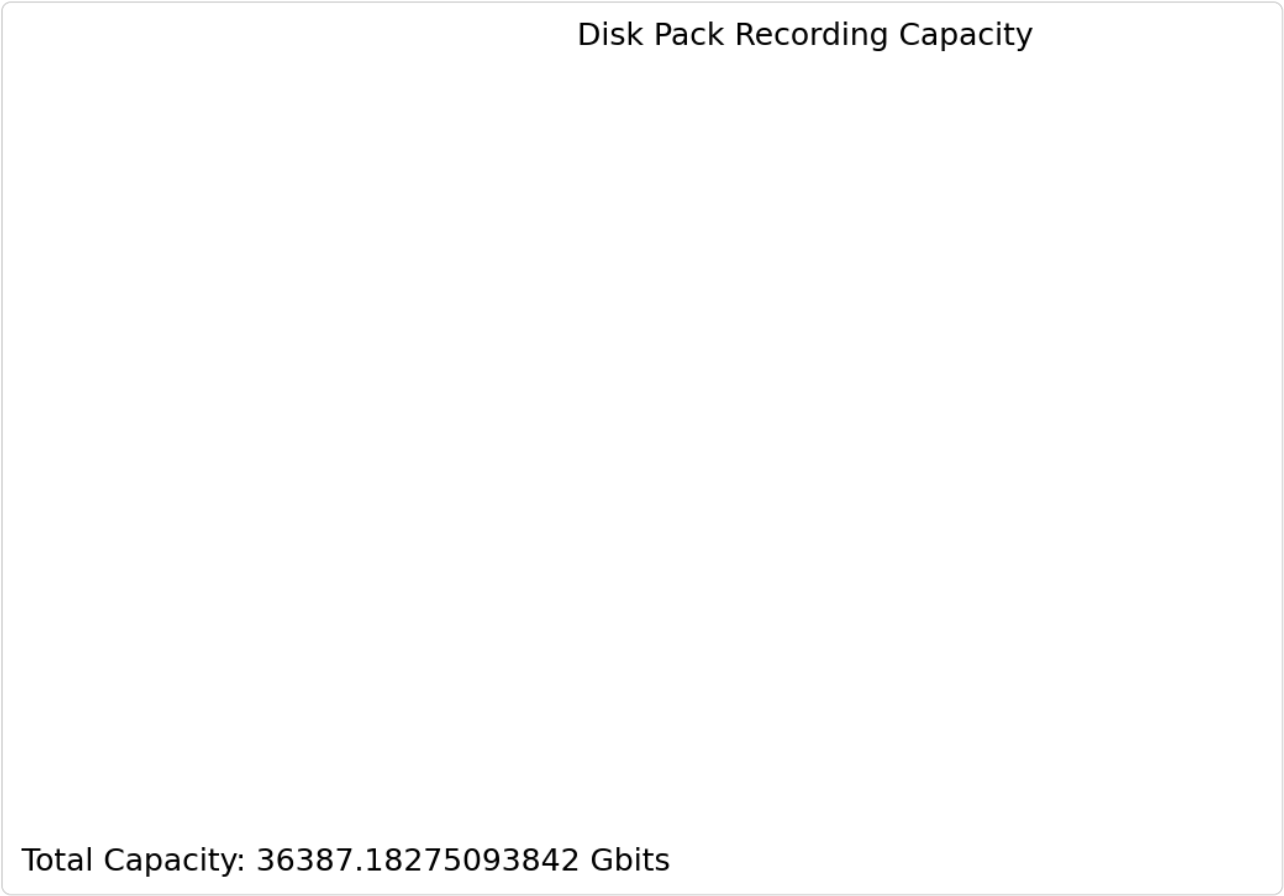
Consider a scenario where a counting semaphore is initialized to 5 to control access to a resource with 5 instances. If Process A performs 3 wait() operations and Process B performs 2 wait() operations on this semaphore, how many resources are currently being used? Explain the process flow and resource availability after each operation.

Marks: 6

Question 7

Consider a disk pack with 19 surfaces, an outer diameter of 22 cm, and an inner diameter of 10 cm. If the spacing between tracks is 0.25 mm, calculate the total recording capacity of the disk pack given a maximum recording density of 1 Gbit per track inch.

This diagram illustrates the total recording capacity of a disk pack based on the provided parameters such as number of surfaces, outer and inner diameter, spacing between tracks, and maximum recording density. *(Generated using matplotlib)*



Marks: 6

Question 8

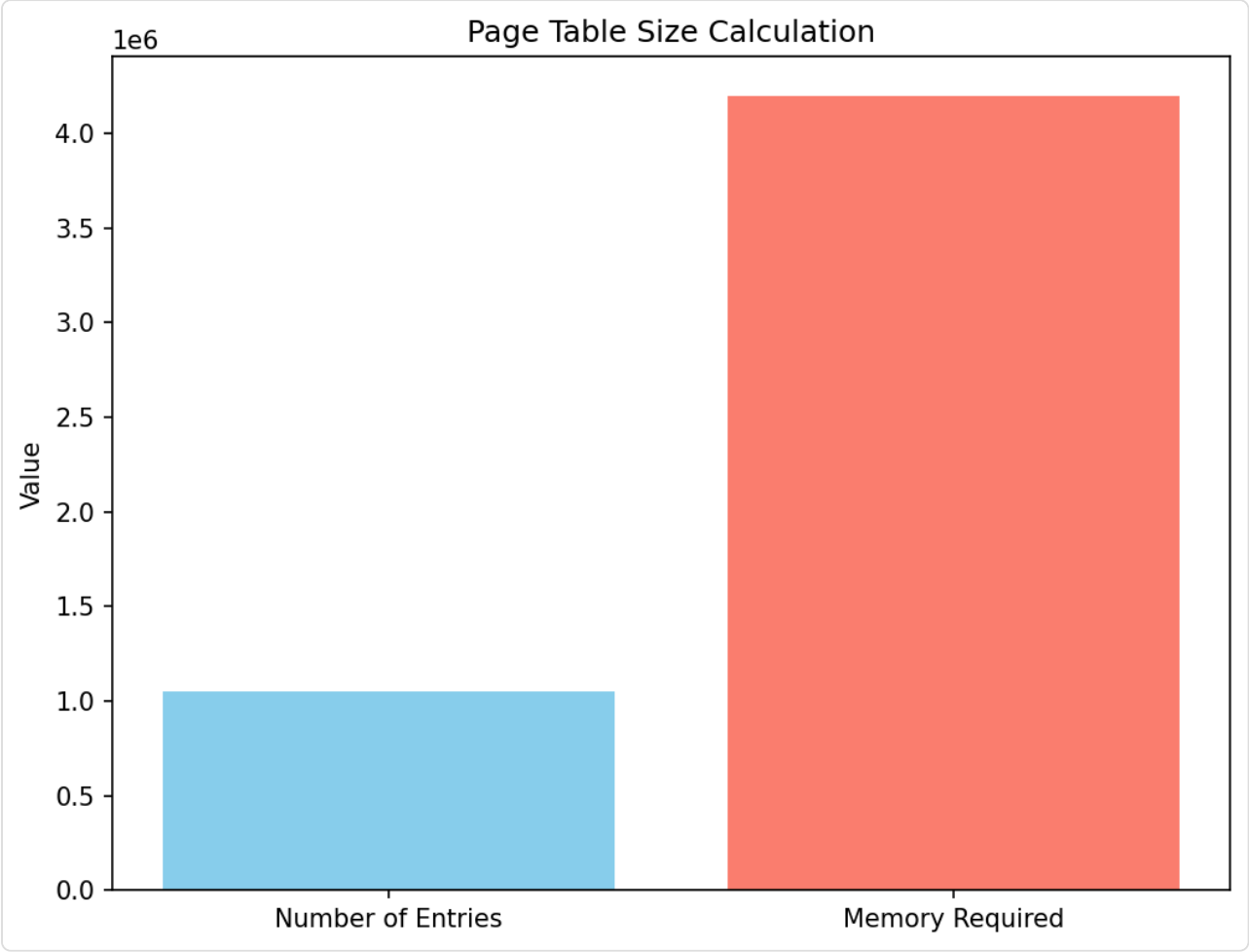
Explain the concept of protection in operating systems and how it relates to controlling access by programs, processes, or users to system and user resources. Provide an example illustrating the importance of protection mechanisms in ensuring authorized usage.

Marks: 5

Question 9

Consider a multimedia operating system with a virtual memory system. If the page size is 4 KB and the virtual address space is 32 bits, calculate the number of entries in the page table assuming a single-level page table system. How much memory is required to store this page table?

Illustrates the calculation of page table size and memory required in a multimedia operating system with virtual memory *(Generated using matplotlib)*

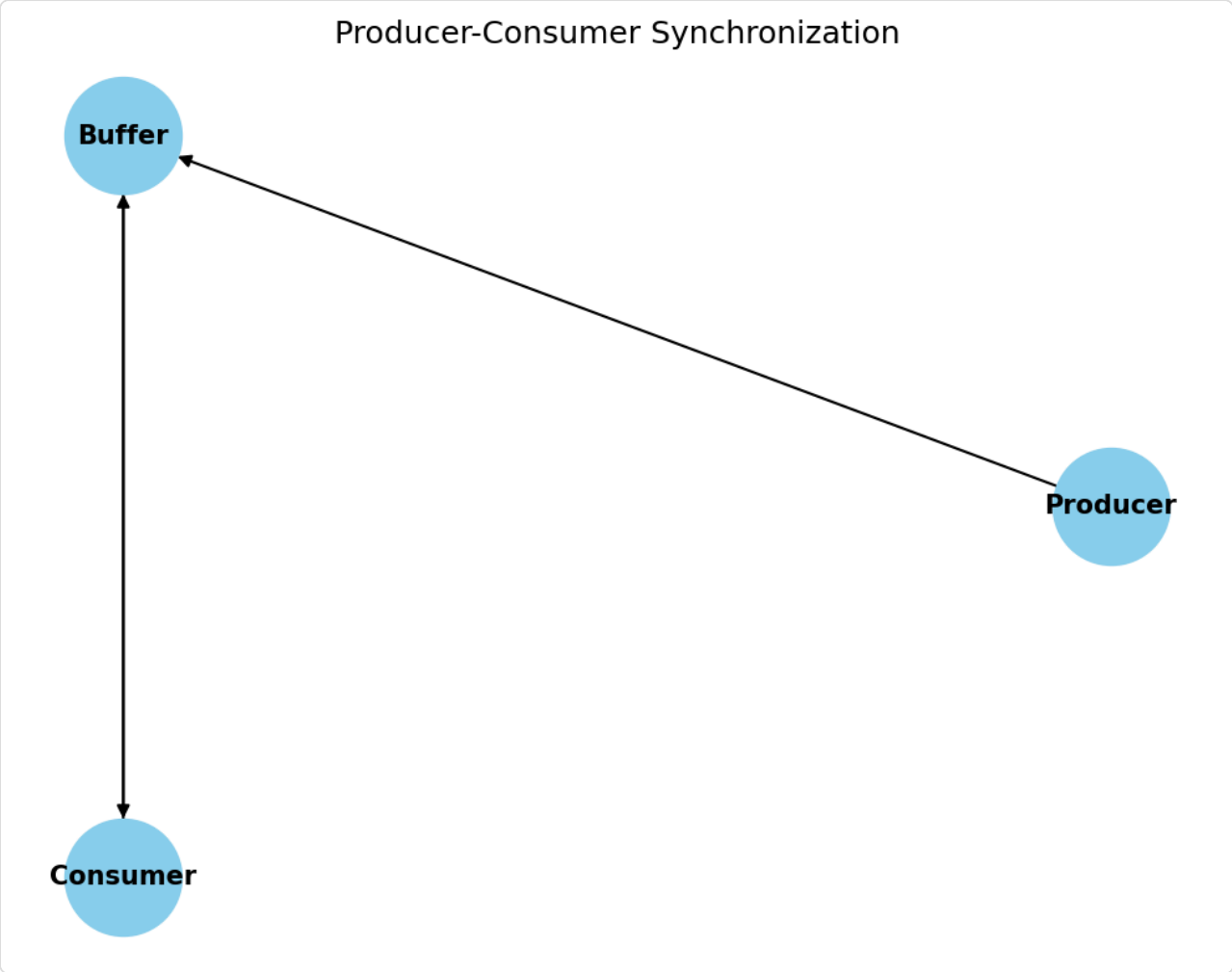


Marks: 5

Question 10

Consider the classical synchronization problem of the Producer-Consumer scenario. A producer process produces items that are consumed by a consumer process. The producer can produce 5 items per second, and the consumer can consume 3 items per second. If the buffer can hold a maximum of 10 items, calculate the average time taken for the buffer to be full from an empty state. Show all calculations and assumptions.

This diagram illustrates the synchronization between a Producer process, a Buffer, and a Consumer process in a Producer-Consumer scenario. *(Generated using NetworkX)*

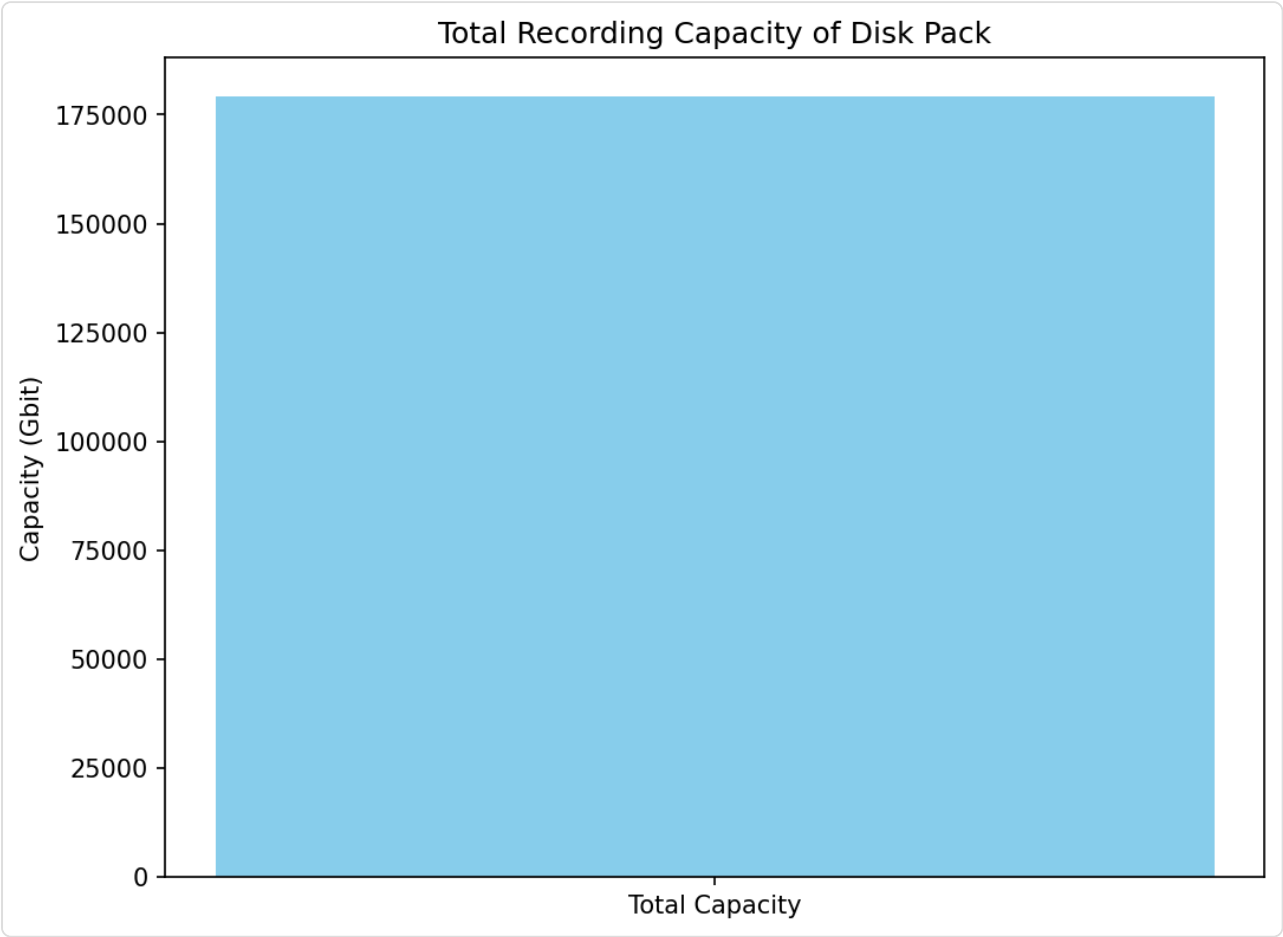


Marks: 10

Question 11

A disk pack has 19 surfaces with outer diameter 22 cm and inner diameter 10 cm. The minimum track spacing is 0.25 mm. Calculate the total recording capacity of the disk pack if the maximum recording density is 1 Gbit per track inch.

This diagram illustrates the total recording capacity of a disk pack based on the given parameters and maximum recording density. *(Generated using matplotlib)*



Marks: 10