1. Compare the main memory organization schemes of contiguous-memory allocation, pure segmentation, and pure paging with respect to the following issues: external fragmentation, internal fragmentation and ability to share code across processes.

Ans:
The contiguous memory allocation scheme suffers from external fragmentation as address spaces are allocated contiguously and holes develop as old processes die and new processes are initiated. It also does not allow processes to share code, since a process's virtual memory segment is not broken into noncontiguous finegrained segments. Pure segmentation also suffers from external fragmentation as a segment of a process is laid out contiguously in physical memory and fragmentation would occur as segments of dead processes are replaced by segments of new processes. Segmentation, however, enables processes to share code; for instance, two different processes could share a code segment but have distinct data segments. Pure paging does not suffer from external fragmentation, but instead suffers from internal fragmentation. Processes are allocated in page granularity and if a page is not completely utilized, it results in internal fragmentation and a corresponding wastage of space. Paging also enables processes to share code at the granularity of pages.

2. Explain why it is easier to share a reentrant module using segmentation than it is to do so when pure paging is used.

Ans:
Since segmentation is based on a logical division of memory rather than a physical one, segments of any size can be shared with only one entry in the segment tables of each user. With paging there must be a common entry in the page tables for each page that is shared.

3. On a system with paging, a process cannot access memory that it does not own; why? How could the operating system allow access to other memory? Why should it or should it not?

Ans:
An address on a paging system is a logical page number and an offset. The physical
page is found by searching a table based on the logical page number to produce a physical page number. Because the operating system controls the contents of this table, it can limit a process to accessing only those physical pages allocated to the process. There is no way for a process to refer to a page it does not own because the page will not be in the page table. To allow such access, an operating system simply needs to allow entries for non-process memory to be added to the process's page table. This is useful when two or more processes need to exchange data—they just read and write to the same physical addresses (which may be at varying logical addresses). This makes for very efficient interprocess communication.