# **Exercises- Chapter 9- Memory Management**

## 1. Name two differences between logical and physical addresses. Given contiguous memory allocation scheme with base and limit registers, explain how logical address is translated to physical address.

## 2. Consider a system in which a program can be separated into two parts: code and data. The CPU knows whether it wants an instruction (instruction fetch) or data (data fetch or store). Therefore, two base– limit register pairs are provided: one for instructions and one for data. The instruction base–limit register pair is automatically read-only, so programs can be shared among different users. Discuss the advantages and disadvantages of this scheme.

## 3. Explain the difference between internal and external fragmentation.

## 4. Describe the following allocation algorithms. Find external fragmentation in each, given the partitions are of sizes 200K, 400K, 600K, 300K and 200K and the processes that arrive and need memory allocation are of sizes 212K, 322K, 422K, 119K, 222K and 312K. (in that order)

## a.       First fit

## b.      Best fit

## c.       Worst fit

## 5. What is compaction and why is it needed?

## 6. Why are page sizes always powers of 2?

## 7. Consider a logical address space of 64 pages of 1024 bytes each, mapped onto a physical memory of 32 frames

## How many bits are there in the logical address?

## How many bits are there in the physical address?

## 8. Under what circumstances do page faults occur? Describe the actions

## taken by the operating system when a page fault occurs

## 9. Compute that Effective Access Time if the time for memory access is 100ns, in three cases – single page table, 2 level paging, 3-level paging.

## 10. What is TLB (Associative Memory)? How is address translation from logical to physical performed with TLB in addition to page table?

## 11. Compute the effective access time if TLB hit ratio is 70% and TLB lookup takes 20ns, and memory access is 100ns.

## 12. What is the effect of allowing two entries in a page table to point to the same page frame in memory? Explain how this effect could be used to decrease the amount of time needed to copy a large amount of memory from one place to another. What effect would updating some byte on the one page have on the other page?

## 13. In the IBM/370, memory protection is provided through the use of *keys.* A key is a 4-bit quantity. Each 2K block of memory has a key (the storage key) associated with it. The CPU also has a key (the protection key) associated with it. A store operation is allowed only if both keys are equal, or if either is zero. Which of the following memory-management schemes could be used successfully with this hardware?

## a. Bare machine

## b. Single-user system

## c. Multiprogramming with a fixed number of processes

## d. Multiprogramming with a variable number of processes

## e. Paging