

- 1) 2 primary functions of an operating system are being a virtual machine and being a resource manager. a) What are the responsibilities of the OS in each function?
b) Give 2 examples of each function. (6 pts)

Function 1: Virtual Machine

Function 2: Resource Manager

- 2) Compare and contrast semaphores and monitors. What are the advantages/disadvantages of each? (6 pts)

3) Message Passing (6pts)

a) Why is message passing necessary when we can use semaphores, mutexes, locks, or monitors for mutual exclusion and synchronization? (3 pts)

b) Describe how you would implement producers/consumers using message passing. (3 pts)

4) Memory compaction (9 pts)

a) What is the difference between internal and external fragmentation? Which type of fragmentation is eliminated by memory compaction?

b) Bitmaps and linked-lists are two ways to manage free space. Describe how memory compaction is performed in each. Which representation is more difficult to compact?

Bitmap:

Linked-list: (Assume a single linked-list implementation.)