Operating Systems–1: CS3510
Theory Assignment 1: Chapters 1, 3
AI20BTECH11025 - Vaishnavi W

1. a. Memory protection using Memory Segmentation: It is an operating system memory management technique where the primary memory of the computer is divided into segments or sections. Any memory location can be referred by segment id - a value indicating the segment it belongs to and an offset - memory location within the segment. Each segment can also have flags indicating permissions like read, write. A set of segment ids can be passed to each process and a process would be permitted to access only those memory segments. A memory management unit (MMU) can be employed to translate the segment id and offset into physical memory address and access it. By providing segment ids to processes, we can prevent one process from manipulating the memory of another.

   b. 1. Handling multiple user requests: Any user requests dealing with the same memory space if are to be handled at the same time, then the processes need to coordinate and communicate. Thus multiple programs need access to the same data and files.
   2. Producer-Consumer problem: It is a classical synchronization problem in OS. In it a producer program produces data and places it in a memory buffer whereas the consumer consumes the data from the memory buffer. Here both the processes share the memory buffer.

2. A process control block in Linux is represented by C structure tast_struct

Process identifier	pid_t pid;
State of the process (-1 unrunnable, 0 runnable, >0 stopped)	long state;
Scheduling information	unsigned int time_slice
Process's parent	struct task struct *parent;
Process's children	struct list head children;
List of open files	struct files struct *files;
Address space of this process	struct mm_struct *mm;
CPU-specific state of this task	struct thread_struct thread;
The signal sent when the parent dies	int pdeath_signal;
PID/PID hash table linkage	struct pid_link pids[PIDTYPE_MAX];

Filesystem information	struct fs_struct *fs;
Time the process starts	struct timespec start_time;
Process credentials - eg. executable name excluding path	char comm[TASK_COMM_LEN];

Source:
https://www.cs.fsu.edu/~zwang/files/cop4610/Fall2016/chapter3.pdf
http://lxr.linux.no/linux+v3.2.35/include/linux/sched.h#L1221