Review Sheet for Exam:

**Chapter 1:**

* An operating system is a program that acts as an intermediary between a user of a computer and the computer hardware
  + It executes user programs and making solving user problems easier
  + Make the computer system convenient to use
  + Use the computer hardware in an efficient manner
* Computer System are divided into four components:
  + Hardware – provides basic computing resources
    - Such as CPU, Memory, I/O devices
  + Operating System
    - Controls and coordinates use of hardware among various applications and users
  + Application programs – this define the ways in which the system resources are used to solve the computing problems of the users
    - Such as word processors, compilers, web browsers, database systems, video games
  + Users
    - People, machine, other computers
* User interacts with the application programs which then interacts with operating system then to the computer hardware
* Kernel is a part of the operating system and is running all the time
* Interrupt vector – contains the addresses of all the service routines
* A trap or exception is a software-generated interrupt caused either by an error or a user request
* An operating system is interrupt driven
* The operating system preserves the state of the CPU by storing the registers and the program counter
* Two methods for handling I/O
  + After I/O starts, control returns to user program only upon I/O completion
  + After I/O starts, control returns to user program without waiting for I/O completion.
* After I/O starts, control returns to user program only upon I/O completion
  + Wait for instructions, idles the CPU until next interrupt
  + Wait loop
  + One I/O request is outstanding at a time, no simultaneous I/O processing
* After I/O starts, control returns to user program without waiting for I/O completion
  + System call – request to the OS to allow user to wait for I/O completion
  + Device status table contains entry for each I/O device indicating its type, address, and state
  + OS indexes into I/O device table to determine device status and to modify table entry to include interrupt.
* How the storage structure is held: there is a main memory that are large storage media that the CPU can access directly
  + They have random access, are typically volatile, and typically random-access memory in form of DRAM
  + Second storage are extension of main memory that provides large nonvolatile storage capacity.
* Storage systems are organized in hierarchy: speed, cost, and volatility.
* Steps for OS operations
  + Bootstrap program- simple code to initialize the system, load the kernel
  + Kernel loads
  + Starts system daemons
  + Kernel interrupt driven (hardware and software)
* Job scheduling – one job selected and run
* Dual mode operation allows OS to protect itself and other system components
  + User mode and kernel mode
* Mode bit provided by hardware
  + Provides ability to distinguish when system is running user code or kernel code
* Timer is set to prevent infinite loop
* Passive entity – program and active entity – process
* Single thread process has one program counter
* Operating systems is responsible for creating and deleting both user and system processes, suspending, and resuming processes, providing mechanisms for process synchronization, providing mechanisms for process communication, providing mechanisms for deadlock handling
* To execute a program, the instruction (all or part of) must be in the memory. As well as data of the program
* OS provides uniform, local view of information storage
* Multitasking environments must be careful to use most recent value, no matter where it is stored in the storage hierarchy
* Multiprocessor environment must provide cache coherency in hardware such that all CPUs have the most recent value in their cache
* One purpose of OS is to hide peculiarities of hardware devices from the user
* The I/O subsystem responsible for:
  + Memory management of I/O including buffering, caching, spooling, general device-driver interface, Drivers for specific hardware devices

Chapter 2

* Operating systems provide an environment for execut4ion of programs and services to programs and users
* One set of operating-system services provides functions that are helpful to the user:
  + User Interface – almost all operating systems have a user interface
  + Programing execution- The system must be able be able to load a program into memory and to run that program, end execution, either normally or abnormally
  + I/O operations – A running program may require I/O, which may involve a file or an I/O device
  + File-system manipulation – The file system is of particular interest. Programs need to read and write files and directories, create and delete them, search them, list file information, permission management
  + Resource allocation-when multiple users or multiple jobs running concurrently, resources must be allocated to each of them
  + Logging – to keep track of which users use how much and what kinds of computer resources
  + Protection and security

Chapter 3

* Process – a program in execution, must progress in sequential fashion.
* Multiple parts: text section, program counter, processor registers, stack containing temporary data, data section containing global variables, and heap containing memory dynamically allocated during run time
* Process control Block
  + Process state – running,waiting,etc
  + Program counter- location of instruction to next execute
  + CPU registers – contents of all process-centric registers
  + CPU scheduling information – priorities, scheduling queue pointers
  + Memory-management information – memory allocated to the process
  + Accounting information – CPU used, clock time elapsed