Department of Computer Science and Engineering
Monsoon Semester – 2020

CS3003D: Operating Systems
Assignment - 4: Classnotes preparation

Group No.	Topic assigned
1	Operating systems- Definition –user view and systems view with a general block diagram Hardware structures-Processor architecture- Memory structure- role of the OS in the management of CPU and Memory
2	Interrupts - Hardware interrupts-software interrupts and exceptions(may use 80x86 architecture as an example) Machines role and OS role
3	I/O devices and interfacing-Programmed I/O, Memory mapped I/O, Polling , interrupt driven I/O, and DMA
4	System call- working (From application program to until IRETURN) with process related system calls as examples
5	Early OS, multiprogramming, time sharing, real time OS and embedded OS-Structure of the OS- Monolithic system, Layered systems, Microkernels, exokernel, client server systems and virtual machine
6	I/O software layers- Interrupt handlers, Device drivers (Use Linux device driver implementation as an example) Device independent I/O Software-Buffering-double buffer-circular buffer. Booting the OS and the shell
7	Memory Management- Basic concepts, address binding , Dynamic linking and loading
8	Contiguous Allocation- Static and dynamic partitioned allocation- Memory fragmentation – internal and external fragmentation
9	Paged memory management- Hardware support- TLB and protection-numerical examples
10	Structure of the page table- Hierarchical page table- Hashed page table and inverted page table
11	Segmented memory management , Swapping and swap space management
12	Virtual Memory- Basic concepts- demand paged memory management- free frame list, cost of demand paging, Copy on write
13	Page replacement algorithms- FIFO, LRU and optimal algorithms. LRU approximation algorithms
14	Allocation of frames-minimum number of frames-Allocation algorithms- global and local allocation
15	Thrashing- working set model - page fault frequency
16	Kernel memory allocation- Buddy system - slab allocation, Other considerations in paged memory like prepaging etc.
17	Mass storage devices- Magnetic disk structure, HDD scheduling algorithms, RAID devices
18	Memory management – OS structure, process, process state, two state process model, Five state process model
19	Process control block, Process management subsystem, Process switching

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Group No.	Topic assigned
20	Process Manager- Trap and context switching, types of scheduling (long, medium, short), Scheduling criteria
21	Preemptive strategies: RR, SRT, Feedback (multilevel)
22	Nonpreemptive strategies: FCFS, SPN, HRRN
23	Threads, POSIX threads, user-level and kernel-level threads
24	Critical section and Resource sharing – Perterson solution, Bakery algorithm
25	IPC – pipes, named pipes, shared memory, message queue
26	Hardware lock – Test and Set, xchg instruction, Spinlock, Mutex
27	Semaphore: producer-consumer problem, reader-writer problem
28	Semaphore – dining philosopher problem, Complete Fair Scheduler
29	Deadlock – prevention techniques
30	Deadlock – avoidance techniques
31	File management - files - implementations - storage abstractions - memory mapped files - directories and their implementation
32	Protection and Security policy and mechanism, Virtual machines
33	Linux File system – a case study

Instructions:

- Deadline of Submission: 11, Dec.'20 (11:59 pm)
- Each group of students should consider the topics indicated against their group number
- Each student in the group should submit the classnote (digitally) individually
- Each topic should be described briefly going beyond the classroom understanding
- Each topic should be approached both theoretically and practically with legible diagrams. Reference of materials (books, research papers, web urls, etc.) should be included in the document.
- Each topic should be described broadly with sections and sub-sections (numbered in order, for e.g.: 1, 1.1, 1.1.1, etc.)
- Template: Times New Roman, Font size 12 with Single line spacing and justified
- A neatly arranged document should be prepared and submitted both in doc and pdf formats. Format of file: FirstName_RollNo.pdf, FirstName_RollNo.doc. Both the files can be zipped into one single compressed file with FirstName_RollNo.rar.

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