**System programming CSX-306**

**Assignment1-Group-I (odd roll\_no) Group-II (even roll\_no)**

**1**. Consider three CPU-intensive processes, which require 10, 20 and 30 time units and arrive at times 0, 2 and 6, respectively. How many context switches are needed if the operating system implements a shortest remaining time first scheduling algorithm? Do not count the context switches at time zero and at the end.

**2**. Consider the 3 processes, P1, P2 and P3 shown in the table.

Process Arrival time Time Units Required

P1 0 5

P2 1 7

P3 3 4

Find out the completion order of the 3 processes under the policies FCFS and RR2 (round robin scheduling with CPU quantum of 2 time units)

**3**. On a system with n CPUs, what is the maximum number of processes that can be in the ready, run, and blocked states?

**4**. Given a system using shortest job first algorithm for short term scheduling and exponential averaging with α=0.5 , what would be next excepted burst time for a processes with burst times of 5, 8, 3 and 5, and initial value for of 10.

**5**. On a system with bytes of memory and fixed partitions, all of size 65,536 bytes. How many bits must the limit register have?

6. What are the two models of inter process communication? What are the strengths and weaknesses of the two approaches?

7. Define the essential properties of the following types of operating systems:

(a) Batch (b) Interactive (c) Time sharing (d) Real time (e) Network (f) Parallel

(g) Distributed (h) Clustered

8. Define the following terms briefly

(i) Busy waiting (ii) Dispatcher (iii) Dirty bit (iv) System call (v) Fragmentation (vi) Paging and segmentation (vii) Thrashing

9. Why is it important for the scheduler to distinguish I/O bound programs from CPU-bound programs?

10. On a simple paging system with bytes of physical memory, 256 pages of logical address space, and a page size of bytes, how many bits are in logical address?

11. On a simple paging system with bytes of physical memory, 256 pages of logical address space, and a page size of bytes, how many bytes are in a page frame?

12. On a simple paging system with bytes of physical memory, 256 pages of logical address space, and a page size of bytes, how many bits are in physical address specify the page frame?

13. On a simple paging system with bytes of physical memory, 256 pages of logical address space, and a page size of bytes, how many entries are in the page table?

14. On a system using demand-paged memory, it takes 200ns to satisfy a memory request if the page is in memory. If the page is not in memory, the request take 7ms if a free frame is available or the page to b swapped out has not been modified. It takes 15ms if the page to be swapped out has been modified. What is the effective access time if the page fault rate is 5%, and 60% of the time the page to be replaced has been modified. Assume the system is only running a single process and the CPU is idle during page swaps.

15. If an instruction take time m if there is no page fault, and time n if there is a page fault, what is the effective instruction time if page faults occur once every i instructions.

16. Explain hard page fault and soft page fault briefly

17. Let the page fault service time be 10ms in a computer with average memory access time being 20ns. If one page fault is generated for every 10^6 memory accesses, what is the effective access time for the memory?

18. Consider a paging hardware with a TLB. Assume that the entire page table and all the pages are in the physical memory. It takes 10 milliseconds to search the TLB and 80 milliseconds to access the physical memory. If the TLB hit ratio is 0.6, the effective memory access time (in milliseconds) is ?

19. Consider a machine with 64 MB physical memory and a 32-bit virtual address space. If the page size is 4KB, what is the approximate size of the page table?

20. Suppose the time to service a page fault is on the average 10 milliseconds, while a memory access takes 1 microsecond. Then a 99.99% hit ratio results in average memory access time of