Third Semester MCA Degree Examination, June 2012
Operating Systems

Time: 3 hrs.   Max. Marks:100

Note: *Answer any FIVE full questions.*

1 a. Define the essential properties of the following types of operating systems:
        i) Real time   ii) Hand held   iii) Mainframe   iv) Tightly coupled.   **(10 Marks)**
    b. Define an operating system. What are the services provided by an operating system?
                                                                                              (10 Marks)

2 a. What are system calls? Briefly describe different categories of these.   **(08 Marks)**
    b. Define context switching and dispatches, with their functions.   **(06 Marks)**
    c. With the help of a state transition diagram, explain various states of a process.   **(06 Marks)**

3 a. Consider the following processes, which have arrived at the ready queue with the burst time
        and the arrival time given in milliseconds as shown below:

Process	Burst Time	Arrival Time	Priority
P_1	8	0	3
P_2	4	1	2
P_3	9	2	4
P_4	5	3	1

Draw the Gantt chart and calculate the average waiting time using the following algorithms:
        i) FCFS   ii) SJF (preemptive)   iii) Priority (preemptive)   iv) RR (Q = 4). **(12 Marks)**
    b. Explain in detail inter process communication (IPC) facility in a system.   **(06 Marks)**
    c. Explain dispatch latency.   **(02 Marks)**

4 a. Define critical section problem and explain the necessary characteristics of a correct
        solution.   **(08 Marks)**
    b. Explain readers/writers problem in detail.   **(08 Marks)**
    c. List out and explain briefly the four necessary conditions for a deadlock to occur.   **(04 Marks)**

5 a. Consider a system with five processes P_0 through P_4 and three resource types R_1, R_2 and R_3.
        Resource type R_1 has seven instances, R_2 has five instances, and R_3 has ten instances.
        Suppose that at time T_0, the following snapshot of the system has been taken:

	Allocation			Max		
	R_1	R_2	R_3	R_1	R_2	R_3
P_0	0	1	0	3	5	7
P_1	0	0	2	2	2	3
P_2	2	0	3	2	0	9
P_3	1	1	2	2	2	2
P_4	2	0	0	3	3	4

Answer the following questions:
        i)   What is content of need matrix?
        ii)   Is the system in safe state?
        iii) If a request from process P_0 arrives for two instances of R_2 resource, can the request be
              granted immediately?   **(10 Marks)**

5 b. What is a page fault? What action does the operating system take when a page fault occurs?
(06 Marks)

    c. Explain briefly segmentation. **(04 Marks)**

6 a. Define internal and external fragmentation. **(06 Marks)**

    b. Explain logical address versus physical address. **(04 Marks)**

    c. Consider the following page reference string:
     1, 2, 3, 4, 5, 3, 4, 1, 6, 7, 8, 7, 8, 9, 7, 8, 9, 5, 4, 5, 4, 2.
    How many page faults occur for the following algorithms, with four page frames?
    i) FIFO   ii) Optimal   iii) LRU **(10 Marks)**

7 a. Explain the different file directory structure, with a neat diagram. **(10 Marks)**

    b. Suppose that a disk drive has 200 cylinders, numbered 0 to 199. The drive is currently serving a request at cylinder 53, and the previous request was at cylinder 57. The queue of pending requests, in FIFO order is:98, 183, 37, 122, 14, 124, 65, 67. Starting from the current head position, what is the total distance (in cylinders) that the disk arm moves to satisfy all the pending requests for each of the following disk scheduling algorithms:
    i) FCFS   ii) SSTF   iii) SCAN   iv) LOOK **(10 Marks)**

8 Write short notes on:
    a. Process management in Linux OS
    b. Thrashing
    c. Boot block
    d. Bad block. **(20 Marks)**

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