BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(END SEMESTER EXAMINATION)

CLASS: BE **SEMESTER : IV**
BRANCH: CSE **SESSION : SP/19**

SUBJECT: CS4107 OPERATING SYSTEM

TIME: 3:00 HOURS **FULL MARKS: 60**

INSTRUCTIONS:
1. The question paper contains 7 questions each of 12 marks and total 84 marks.
2. Candidates may attempt any 5 questions maximum of 60 marks.
3. The missing data, if any, may be assumed suitably.
4. Before attempting the question paper, be sure that you have got the correct question paper.
5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.

Q.1(a) What is the purpose of system calls? Explain with an example. [2]
Q.1(b) How does file system keep track of free spaces? Elaborate how free space management is done? [4]
Q.1(c) Describe the essential properties of the following types of operating systems: [6]
(i) Batch (ii) Time sharing (iii) Real time (iv) Parallel (v)Distributed

Q.2(a) What advantage is there in having different time quantum sizes on different levels of a multilevel queuing system? [2]
Q.2(b) Distinguish among the following three levels of scheduler. [4]
(i) High level scheduler
(ii) Intermediate level scheduler
(iii) Dispatcher
Q.2(c) Consider the following set of processes, with the length of the CPU-burst time given in milliseconds (A LARGER priority number has a higher priority): [6]

Process	Arrival Time	Burst time	Priority
P_1	0	6	4
P_2	3	5	2
P_3	3	3	6
P_4	5	5	3

Draw the Gantt chart circulate waiting time and turnaround time using i) FCFS ii) Preemptive priority scheduling algorithm

Q.3(a) Consider a logical address space of 64 pages of 1,024 words each, mapped onto a physical memory of 32 frames. [2]
i) How many bits are there in the logical address?
ii) How many bits are there in the physical address?
Q.3(b) Given the memory partitions of 100K, 500K, 200K, 300K, and 600K apply First fir and last fit algorithm to place 212K, 417K, 112K, 426K. [4]
Q.3(c) Discuss how fragmentation manifests itself in each of the following types of virtual memory system? [6]
(i) Paging
(ii) Segmentation
(iii) Combined segmentation and paging

Q.4(a) Suppose the bus between memory and secondary storage is experiencing heavy page traffic. Does this imply thrashing? Explain. [2]
Q.4(b) Explain why Demand paging can significantly affect the performance of a computer system. [4]
Q.4(c) Given that main memory is composed of three page frames for public use and that a program requests pages in the following order: a b a c a b d b a c d [6]
i) Using the FIFO page removal algorithm, do a page trace analysis indicating page faults with asterisks (*). Then compute the failure and success ratios.
ii) Using the LRU page removal algorithm do a page trace analysis and compute the failure and success ratios.
iii) Which is better? Why do you think it's better? Can you make a general statement from this example? Why or why not?

Q.5(a) Is disk scheduling, other than FCFS scheduling, useful in a single user environment? Explain your answer. [2]

Q.5(b) Could a RAID level 1 organization achieve better performance for read requests than a RAID level 0 organization (with non redundant striping of data)? If so, how? [4]

Q.5(c) Suppose that a disk drive has 5000 cylinders, numbered 0 to 4999. The drive is currently serving a request at cylinder 143 and the previous request was at cylinder 125. The queue of pending requests, in FIFO order is, [6]
86, 1470, 913, 1774, 948, 1509, 1022, 1750, 130.
What is the total distance the disk arm moves to satisfy all the pending requests for each of the following disk scheduling algorithms from current position i) FCFS ii) SCAN iii)LOOK

Q.6(a) What are the major differences between deadlock, starvation and race? Give some real life examples (not related to a computer system environment) of deadlock, starvation and race. [2]

Q.6(b) Prove that the safety algorithm requires an order of $m \times n^2$ operations. [4]

Q.6(c) Consider the following snapshot of a system: [6]

	Allocation	Max	Available
	A B C D	A B C D	A B C D
P0	0 0 1 2	0 0 1 2	1 5 2 0
P1	1 0 0 0	1 7 5 0	
P2	1 3 5 4	2 3 5 6	
P3	0 6 3 2	0 6 5 2	
P4	0 0 1 4	0 6 5 6	

Answer the following questions using the banker's algorithm:
i) What is the content of the matrix Need?
ii) Is the system in a safe state?
iii) If a request from process P1 arrives for (0,4,2,0), can the request be granted immediately?

Q.7(a) What is critical-section problem? How semaphores are helpful in solving this problem? [2]

Q.7(b) Explain the security problem. What are the levels on which the security measures are to be taken? [4]

Q.7(c) Does Peterson's solution to mutual exclusion problem work when process scheduling is preemptive. How about when it is non preemptive. [6]

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