

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

**CLASS: IMSC  
BRANCH: MATHS & COMP.**

**SEMESTER : VI/ADD  
SESSION : SP/19**

**SUBJECT: CS4107 OPERATING SYSTEM**

**TIME: 3.00 Hrs.**

**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.
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- Q.1(a) Explain evolution of operating systems. [2]  
Q.1(b) With a neat sketch, describe the services that an operating system provides to users, processes and other systems. [4]  
Q.1(c) Briefly Explain the different types of systems: parallel systems, distributed systems and real-time systems? [6]

- Q.2(a) Define Throughput with an example. [2]  
Q.2(b) Define starvation. Which of the scheduling algorithms result in starvation and why? Explain. [4]  
Q.2(c) [6]

PROCESS	ARRIVAL TIME	BURST TIME
P1	0	9
P2	2	4
P3	4	1
P4	5	3
P5	3	7

Solve the above problem with:

- I. Shortest Remaining Time First
- II. Round Robin (Quantum= 2)
- III. FCFS

by drawing Gantt chart and also calculate the average waiting time, turnaround time and throughput.

- Q.3(a) What is compaction and why it is used? [2]  
Q.3(b) What is Belady's anomaly? Explain with suitable example. [4]  
Q.3(c) Consider a logical address space of 64 pages of 4096 words each, mapped onto a physical memory of 32 frames. How many bits are there in the offset, logical address and physical address Space? [6]

- Q.4(a) What is a Virtual Memory? Discuss the benefits of virtual memory technique. [2]  
Q.4(b) What is Thrashing? How does the system detect Thrashing? What can the system do to eliminate this problem? [4]  
Q.4(c) For the Page Reference String: [6]  
7, 0, 1, 2, 0, 3, 0, 4, 2, 3, 0, 3, 2, 1, 2, 0. 1. 7, 0, 1  
Calculate the Page Faults applying (i) Optimal (ii) LRU and (iii) FIFO Page Replacement Algorithms for a Memory with three frames.

- Q.5(a) What is seek time and rotational latency? [2]  
Q.5(b) If a disk has avg. seek time of 30ms, rotates 3600 revolutions per minutes, has 4096 Bytes per sector, and each track has 512 sector, total no of 1000 tracks per surface with 8 platters, then what is the data transfer rate and number of bit required for sector address? [4]  
Q.5(c) Consider a disk with 200 tracks and the queue has random requests from different processes in the order: [6]  
55, 58, 39, 18, 90, 160, 150, 38, 184  
Initially arm is at 100. Find the Average Seek length using FIFO, SSTF and C-SCAN algorithm.

- Q.6(a) What are the necessary conditions for deadlock? [2]  
Q.6(b) What is deadlock? Describe the Methods for Handling Deadlocks. [4]

Q.6(c) Considering a system with five processes  $P_0$  through  $P_4$  and three resources of type A, B, C. Resource type A has 10 instances, B has 5 instances and type C has 7 instances. Suppose at time  $t_0$  following snapshot of the system has been taken: [6]

Process	Allocation			Max			Available		
	A	B	C	A	B	C	A	B	C
$P_0$	0	1	0	7	5	3	3	3	2
$P_1$	2	0	0	3	2	2			
$P_2$	3	0	2	9	0	2			
$P_3$	2	1	1	2	2	2			
$P_4$	0	0	2	4	3	3			

- I. What will be the content of the Need matrix?
- II. Is the system in a safe state? If Yes, then what is the safe sequence?
- III. What will happen if process  $P_1$  requests one additional instance of resource type A and two instances of resource type C?

Q.7(a) What is a critical section? Explain with examples. [2]

Q.7(b) What are the minimum requirements that should be satisfied by a solution to critical section problem? [4]

Q.7(c) What is a semaphore? List the types of semaphores and Show that, if the wait() and signal() semaphore operations are not executed atomically, then mutual exclusion may be violated. [6]

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