



**PART - A (8 X 5 = 40 Marks)**

Answer ALL Questions

1. a) Operating System is  
(i) Firmware (ii) Software (iii) Hardware (iv) Middleware (v) All  
b) List out the various services of the OS and brief about each. [4]
2. Discuss in detail about the following with suitable sketch  
a) Task Control Block (TCB) [2]  
b) Different states of processes and its various methodology for changing their states [3]
3. a) Compare Message-Passing and Shared-Memory models of Communication. [3]  
b) "A thread is also called as a Light Weight Process", why? Also mention their benefits. [2]
4. a) Represent the Queuing diagram of process scheduling and explain the same. [3]  
b) Mention the necessary actions will be taken during context switching between processes. [2]
5. a) There are 3 processes ( $P_1, P_2$ , and  $P_3$ ) and 4 resources ( $R_1, R_2, R_3, R_4$ ) with single instance for  $R_1$  and  $R_2$ ,  $R_3$  has three instances and  $R_4$  has two instances respectively. Construct resource allocation graph for the given data and identify whether deadlock is exist in the current allocation or not? [3]  
Processes,  $P = \{P_1, P_2, P_3\}$   
Resources,  $R = \{R_1, R_2, R_3, R_4\}$   
Edges,  $E = \{P_1 \rightarrow R_1, R_1 \rightarrow P_2, P_2 \rightarrow R_2, R_2 \rightarrow P_3, R_3 \rightarrow P_1, R_3 \rightarrow P_2, R_4 \rightarrow P_2, P_3 \rightarrow R_4, P_3 \rightarrow R_3\}$   
b) Illustrate the three main bodies of Linux system. [2]
6. a) With an example synchronization construct, state how "busy waiting" wastes CPU cycles and also present the solution to reduce the wastage of CPU cycles. [2]  
b) Show that concurrent execution of processes leads to race condition with an example. [3]
7. a) Distinguish between Paging and segmentation. [3]  
b) Name the three methods of allocating disk space for file systems. [2]
8. Given memory partitions of 5K, 40K, 25K, 32K, 50K and 64K (in order), how would each of the First-fit, Best-fit and Worst-fit algorithms place processes of 35K, 4K, 23K, 30K, 54K and 49K (in order)? Which algorithm makes the most efficient use of memory?

**PART - B (6 X 10 = 60 Marks)**

Answer any SIX Questions

9. a) What is mean by system call? List out the various system calls in OS & explain its various functions & features.  
b) Distinguish between  
(i) Symmetric and Asymmetric multiprocessing  
(ii) Long term scheduler and Short term scheduler  
(iii) Multi-programming and Multi-tasking

10. Consider the following set of processes with the length of the CPU burst time in Milliseconds.

Process	Arrival Time	Priority	Burst Time
A	0	3	4
B	1	4	5
C	3	2	6
D	5	1	2
E	6	5	8

- i) Draw four Gantt chart illustrating the execution of these processes using FCFS, preemptive SJF, non-preemptive Priority (a small priority number implies a higher priority) and RR (Quantum= 2) scheduling. [6]
- ii) Calculate the average waiting time and average Turnaround time for the above scheduling algorithms. [4]
11. a) State and explain the drawback of typical "Semaphore" solution to Dining-Philosophers problem with pseudo code, also provide a solution to remedy the drawback. [5]
- b) Write a "Monitor" solution to Bounded-Buffer problem. [5]
12. The operating system contains 4 resources A, B, C and D the No. of instances of each resource type is 3, 14, 12 and 12 respectively. The current resource allocation state is as shown below in the table.

Process	Allocation				Max			
	A	B	C	D	A	B	C	D
P <sub>0</sub>	0	0	1	2	0	0	1	2
P <sub>1</sub>	1	0	0	0	1	7	5	0
P <sub>2</sub>	1	3	5	4	2	3	5	6
P <sub>3</sub>	0	6	3	2	0	6	5	2
P <sub>4</sub>	0	0	1	4	0	6	5	6

- i) Is the current allocation in a safe state? [2]
- ii) Can the request made by process P<sub>1</sub> (0, 4, 2, 0) be granted? [2]
- iii) Check whether the given process execution sequence is safe or unsafe < P<sub>0</sub> P<sub>2</sub> P<sub>3</sub> P<sub>4</sub> P<sub>3</sub>>. Suppose it is unsafe give the safe process execution sequence and provide each stage "Available & Allocation" strategy. [6]

13. Suppose that a disk drive has 200 cylinders, numbered 0 to 199. Assume that the disk head starts at cylinder 50. The queue of pending requests, in FIFO order, is

95, 180, 34, 119, 11, 123, 62 and 54

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? Also assume the head is moving towards 0 in SCAN and Circular SCAN.

- (i) First-Come, First-Serve
- (ii) Shortest-Seek-Time-First
- (iii) SCAN
- (iv) Circular-SCAN

[2.5]  
[2.5]  
[2.5]  
[2.5]

14. Consider the following page-reference string

1, 2, 3, 2, 1, 5, 2, 1, 6, 2, 5, 6, 3, 1, 3, 6, 1, 2, 4, 3, 20

How many Page Miss would occur in the following page replacement algorithms, assuming three page frames? Remember that all frames are initially empty, so your first unique pages will all cost one fault each.

- i) Least-Recently-Used
- ii) First-In-First-Out replacement
- iii) Optimal replacement

[3]  
[3]  
[4]

5. Discuss in detail about various issues in security methods provided in modern operating systems.

6. Explain about Paravirtualization, also mention the three types of hardware virtualization techniques with suitable sketch. [6+4]

