N.B. (1) Question no 1 is compulsory

    (2) Attempt any **three** questions out of remaining five questions

1. Attempt any **four**
   (i) What is mutual exclusion? Explain its significance.   5
   (ii) Explain the concept of Segmentation.   5
   (iii) What is Semaphore? Explain any one type of Semaphore.   5
   (iv) Explain services provided by Operating system.   5
   (v) What is use of modify bit and present bit in page table?   5

2. (a) Explain the following in brief :
   i) Process Synchronisation   ii) Inter-Process Communication   10
   (b) Explain hardware support for paging.   10

3. (a) What is deadlock ? Explain necessary and sufficient conditions to occur deadlock.   10
   Suggest techniques to avoid deadlock.

   (b) Assume following processes arrive for execution at the time indicated and length of CPU burst   10
   time given in ms.

Process	Burst Time	Arrival Time	Priority
P1	10	0	5
P2	6	0	2
P3	7	1	4
P4	4	1	1
P5	5	2	3

   Find AWT, ATAT for FCFS, SJF (Non-preemptive) & Round Robin (Quantum – 3 ms)

4. (a) What are the various allocation methods with reference to file systems.   10
   (b) Calculate hit and miss percentage for the following string using page replacement policies   10
   FIFO, LRU and Optimal. Compare it for the frame size 2 and 4.
   2,0,3,0,4,2,3,0,3,2,7,2,0,7,5,0,7,5,7,0

5. (a) We assume a disk with 200 tracks and disk request queue has random requests in it.
   The requested tracks in the order received by disk scheduler, are 55,58,39,18,90,160,150,38,184.
   Starting at track 100. Calculate average seek length using FIFO, SSTF, SCAN and C-SCAN.
   Give which disk scheduling is best for this scenario.   10

   (b) Explain I/O management in UNIX   10

6. Write a short note on the following: (Any Four)   20
   (a) Resource allocation graph
   (b) Process control block
   (c) System components in Windows architecture
   (d) Scheduling in Linux System
   (e) Virtual memory