N. B.:   (1) **All** questions are **compulsory**.
   (2) Make **suitable assumptions** wherever necessary and **state the assumptions** made.
   (3) Answers to the **same question** must be **written together**.
   (4) Numbers to the **right** indicate **marks**.
   (5) Draw **neat labeled diagrams** wherever **necessary**.
   (6) Use of **Non-programmable** calculators is **allowed**.

1.   **Attempt _any three_ of the following:**   15
a.   List various operating systems. Explain any two.
b.   Define Operating System. How operating system can be used as a resource manager.
c.   What do you mean by system call? Write the system calls for directory management.
d.   Write a short note on process termination.
e.   What is race condition? How to avoid race condition?
f.   Explain the shortest job first scheduling algorithm with suitable example.

2.   **Attempt _any three_ of the following:**   15
a.   What is the purpose of base and limit registers?
b.   How memory is managed with linked list?
c.   List various page replacement algorithms. Explain any one with example.
d.   List and explain different types of files.
e.   List and explain various operations on files.
f.   Write the meaning of following file attributes.
     1. Owner   2. Creation time   3. Current size   4. Key position   5. Protection

3.   **Attempt _any three_ of the following:**   15
a.   Explain the concept of direct memory access.
b.   Write a short note on device driver.
c.   Explain various levels of RAID.
d.   Define deadlock. Write the conditions for resource deadlock.
e.   How deadlock is prevented?
f.   Explain the working of banker's algorithm for a single resource.

4.   **Attempt _any three_ of the following:**   15
a   Write a short note on memory virtualization
b   Write the requirement for virtualization.
c   Write the essential characteristics of cloud.
d   Explain the crossbar switch structure used for UMA multiprocessors.
e   List various multiprocessor operating types. Explain any one.
f   List and explain various interconnection technologies for multicomputer.

5.   **Attempt _any three_ of the following:**   15
a.   Explain the booting process of Linux
b.   Discuss the process-management system calls in Linux.
c.   Explain the concept of shell in Linux.
d.   Explain the fundamental concept of memory in Windows.
e.   Write a short note on catching in Windows.
f.   How scheduling is carried out in Windows.