(2 ½ Hours) [Total Marks: 75]

N.B: (1) All questions are compulsory.
    (2) Figures to the right indicate marks.
    (3) Illustrations, in-depth answers and diagrams will be appreciated.
    (4) Mixing of sub-questions is not allowed.

Q1. **Attempt the following (any THREE):** **(15)**
(A) Explain storage-device hierarchy.
(B) What is direct memory access (DMA)? What is its use?
(C) Operating system is responsible for which activities in connection with process management?
(D) List various system calls and explain them briefly.
(E) What is a process? Explain various states of a process.
(F) What is process scheduling? Explain queuing diagram representation of process scheduling.

Q2. **Attempt the following (any THREE):** **(15)**
(A) With suitable example explain Round Robin scheduling algorithm.
(B) Define critical section problem. A solution to the critical-section problem must satisfy what requirements?
(C) What are semaphores? How they are implemented?
(D) Give hardware solution for process synchronization.
(E) What is mutual exclusion? How it is implemented?
(F) Describe multilevel feedback-queue scheduling algorithm.

Q3. **Attempt the following (any THREE):** **(15)**
(A) Describe the readers-writers problem.
(B) Describe necessary conditions for a deadlock to occur.
(C) Describe paging as a memory management scheme.
(D) Describe deadlock using a directed graph called a system resource-allocation graph.
(E) Explain recovery from a deadlock.
(F) What is virtual memory? Why it is required?

Q4. **Attempt the following (any THREE):** **(15)**
(A) Explain various file attributes and file operations.
(B) Explain two level directory structures.
(C) Explain with suitable example FCFS disk scheduling algorithm.
(D) Describe in brief I/O hardware.
(E) Explain the security problem related to operating system.
(F) Describe Interrupt-driven I/O cycle.

Q5. **Attempt the following (any THREE):** **(15)**
(A) What is preemptive and non-preemptive scheduling? Explain characteristics of good scheduler.
(B) Describe the services of an operating system provided to users.
(C) Explain the Dining philosopher's problem. Give its solution.
(D) With neat figure explain layered operating system.
(E) Describe Process Control Block (PCB) in detail.
(F) Describe segmentation as a memory management scheme.

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