(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) Discuss the activities of operating system in regards with Process Management.
(B) Diagrammatically explain five state process model.
(C) Explain Process Control Block.
(D) Write a short note on:
  i) Time Sharing System
  ii) Real time System
(E) Write a short note on Cooperating processes.
(F) Describe Layered approach in operating system design.

Q2. **Attempt the following (any THREE):** **(15)**

(A) Consider the following table. Calculate average waiting time using SJF (Preemptive) algorithm.

Process	Burst Time (ms)
P1	2
P2	4
P3	5
P4	3
P5	4
P6	6

(B) Diagrammatically explain queuing representation of process scheduling.
(C) Explain direct communication approach of IPC.
(D) Define Scheduler. List and explain types of schedulers.
(E) Write a short note on Critical section. Also, write the solution for it.
(F) What is user thread and kernel thread? List and explain Multithreading models.

Q3. **Attempt the following (any THREE):** **(15)**

(A) Discuss following with respect to Resource Allocation Graph used in Deadlock:
  i) Notations used in graph
  ii) Formulate a suitable example & explain whether it is deadlock free or not.
(B) Consider the following page reference string & find the total number of page faults using OPT where page frame size is 3
2 0 2 2 4 5 0 2 6 5 4 2 0

(C) State Producer-Consumer problem. Also write the algorithm for the same.
(D) Diagrammatically explain steps in handling page faults.
(E) Define Deadlock. Explain Deadlock prevention techniques.
(F) Explain in short Paging technique.

Q4. Attempt the following (any THREE): (15)

(A) Explain single-level and two-level directory.
(B) Assume there are total 200 tracks are present on each surface of the disk (0 to 199). If request queue is 32, 111, 151, 51, 186 and initial position of the head is 41. Apply SSTF and FCFS disk scheduling and calculate total head movements.
(C) Write any five file attributes.
(D) Explain the following:
  i) Virus
  ii) Worms
(E) Write a short note on Direct Memory Access (DMA).
(F) Discuss Linked allocation method.

Q5. Attempt the following (any THREE): (15)

(A) Explain the following:
  i) Polling
  ii) Interrupts
(B) List and explain data structures used in Bankers algorithm.
(C) Define the following terms regarding Semaphore:
  i) Semaphore
  ii) Counting Semaphore
  iii) Binary Semaphore
  iv) wait()
  v) signal()
(D) Write a short note on Context Switch.
(E) List various services provided by OS & explain any four.
(F) Write any five operating system services.
