

Sem-IV (CMPH) (NEP 2020) May 2026

Duration: 2 Hours

Max. Marks: 60

- N.B.: (1) Question No 1 is Compulsory.  
 (2) Attempt any three questions out of the remaining five.  
 (3) All questions carry equal marks.  
 (4) Assume suitable data, if required and state it clearly.

**Q.1 Solve any three questions out of five: (05 marks each)** 15

- a) Illustrate 5 Process scheduling criteria. 05  
 b) Describe the system boot process and define Real-time OS, list two applications of Real-time OS. 05  
 c) Draw and explain a flowchart of DOWN(S) and UP(S) mutual exclusion primitive of Semaphore. 05  
 d) Explain how thrashing is associated with multi-programming. 05  
 e) Describe two types of directory structure: Two-Level and Tree-Structured. 05

**Q 2** 15

- a) Explain File Allocation methods in detail. 07  
 b) Explain First fit, Best fit, Worst fit and Next fit with a suitable example. 08

**Q 3** 15

- a) Explain the logical-to-physical address translation in paging with a suitable diagram and example. 07  
 b) Consider the set of 5 processes whose arrival time and burst time are given below. If the CPU scheduling policy is SJF preemptive, evaluate the average waiting time and average turnaround time. Draw a Gantt chart and tabularize the results. 08

| Process id | Arrival Time | Burst Time |
|------------|--------------|------------|
| P1         | 3            | 1          |
| P2         | 1            | 4          |
| P3         | 4            | 2          |
| P4         | 0            | 6          |
| P5         | 2            | 3          |

- Q 4** 15
- a) How the Resource Allocation Graph can be used to detect deadlock in the system. 07  
Give a suitable example.
- b) Suppose the head of a moving disk with 200 tracks, numbered 0 to 199, is currently 08  
serving a request at track 143 and has just finished a request at track 125. If the queue  
of requests is kept in the following order 55, 86, 147, 91, 177, 115, 94, 150, 100, 175  
and 130, evaluate total head movement to satisfy these requests for the following disk  
scheduling algorithms: (a) SCAN (b) LOOK.
- Q 5** 15
- a) Explain the monolithic and micro-kernel OS structure with a suitable diagram 07
- b) Draw and explain process state transition diagram. 08
- Q 6** 15
- a) Explain the Critical Section Problem. Explain the Hardware Solution proposed 07  
to achieve the same.
- b) Explain Cloud OS and Mobile OS Architecture with diagrams. 08