| U.S.N. | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|

# B.M.S. College of Engineering, Bengaluru-560019

**Autonomous Institute Affiliated to VTU**

## June 2025 Semester End Main Examinations

**Programme: B.E.** **Semester: III**
**Branch: Information Science and Engineering** **Duration: 3 hrs.**
**Course Code: 23IS3PCOPS/22IS3PCOPS** **Max Marks: 100**
**Course: Operating Systems**

**Instructions**: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.



**Important Note:** Completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages. Revealing of identification, appeal to evaluator will be treated as malpractice.

| | | | CO | PO | Marks |
|---|---|---|---|---|---|
| | | **UNIT - I** | | | |
| 1 | a) | Elucidate the Operating system services. | CO1 | PO1 | **10** |
| | b) | Interpret the role of operating system with respect to two viewpoints. | CO1 | PO1 | **10** |
| | | **OR** | | | |
| 2 | a) | List and explain the various Kernel Data Structures used in Operating System. | CO1 | PO1 | **8** |
| | b) | Explain various Computing Environments in detail. | CO1 | PO1 | **12** |
| | | **UNIT - II** | | | |
| 3 | a) | With a neat diagram describe the various states of a process. | CO1 | PO1 | **4** |
| | b) | Inter Process Communication (IPC) is possible through shared memory and message passing. Justify the statement with suitable diagrams. | CO2 | PO3 | **10** |
| | c) | Write briefly the process of the classic synchronization problem of Dining Philosopher’s. | CO2 | PO2 | **6** |
| | | **OR** | | | |
| 4 | a) | Context Switching between two processes $P_0$ and $P_1$ is observed, represent and write the entire process involved in switching using a neat diagram. | CO2 | PO1 | **10** |
| | b) | Illustrate the shared memory concept of cooperating processes using producer consumer problem. | CO2 | PO2 | **10** |
| | | **UNIT - III** | | | |
| 5 | a) | Differentiate between Preemptive and Non-Preemptive CPU Scheduling. | CO3 | PO2 | **5** |
| | b) | Explicate the scheduling criteria of CPU scheduling algorithms. | CO3 | PO2 | **5** |

c) Consider the following set of processes, with the length of the CPU burst given in milliseconds:

| Process | BurstTime | Priority |
|---|---|---|
| P1 | 2 | 2 |
| P2 | 1 | 1 |
| P3 | 8 | 4 |
| P4 | 4 | 2 |
| P5 | 5 | 3 |

The processes are assumed to have arrived in the order P1, P2, P3, P4, P5, all at time 0.

a. Draw four Gantt charts that illustrate the execution of these processes using the following scheduling algorithms: FCFS, SJF, non preemptive priority (a larger priority number implies a higher priority), and RR (quantum = 2).

b. What is the turnaround time of each process for each of the scheduling algorithms in part a?

c. What is the waiting time of each process for each of these scheduling algorithms?

d. Which of the algorithms results in the minimum average waiting time (over all processes)?

CO3 | PO3 | 10

**OR**

6 a) Consider the following snapshot of a system:

| Process | Allocation | | | | Max | | | | Available | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | A | B | C | D | A | B | C | D | A | B | C | D |
| P0 | 2 | 0 | 0 | 1 | 4 | 2 | 1 | 2 | 3 | 3 | 2 | 1 |
| P1 | 3 | 1 | 2 | 1 | 5 | 2 | 5 | 2 | | | | |
| P2 | 2 | 1 | 0 | 3 | 2 | 3 | 1 | 6 | | | | |
| P3 | 1 | 3 | 1 | 2 | 1 | 4 | 2 | 4 | | | | |
| P4 | 1 | 4 | 3 | 2 | 3 | 6 | 6 | 5 | | | | |

Apply Banker's algorithm and answer the following. i) Is the system in safe state? If so, give the safe sequence. ii) If process P2 requests (0,1,1,3) resources can it be granted immediately?

CO3 | PO3 | 10

b) Explain in detail the deadlock prevention methods.

CO4 | PO2 | 5

c) A system has 4 resource types R1, R2, R3, R4 with single instance and 5 processes P1, P2, P3, P4, P5.
Consider the following snapshot at time $t_0$:
R1 is held by P2, R3 is held by P4, R2 is held by P1,
P4 requests R1 and R4, P5 requests R1, P1 requests R3,
P3 requests R3.
Predict the following:
i. Can Resource allocation graph be constructed? Draw if yes.
ii. Can system be checked for safe or unsafe state? Justify.

CO4 | PO3 | 5

| | | | | | | |
|---|---|---|---|---|---|---|
| | | | **UNIT - IV** | | | |
| | 7 | a) | Describe the importance of Demand-paging in memory management scheme. With a neat diagram explain the steps involved in handling a page fault. | *CO3* | *PO2* | **10** |
| | | b) | Given six memory partitions of 300kb, 600kb, 350kb, 200kb, 750kb and 125kb(in order), how would each of the First-fit, Best-fit, and Worst-fit algorithms place processes of 115kb, 500kb, 358kb, 200kband 375kb (in order)? | *CO3* | *PO3* | **10** |
| | | | **OR** | | | |
| | 8 | a) | Consider the following page reference string<br>1, 2, 3, 4, 2, 1, 5, 6, 2, 1, 2, 3, 7, 6, 3, 2, 1, 2, 3, 6.<br>Assuming there are 3 memory frames, how many page faults would occur in the case of<br>i) LRU algorithm<br>ii) optimal algorithm<br>iii) FIFO algorithm.<br>Note that initially all frames are empty. | *CO3* | *PO3* | **10** |
| | | b) | Define Translation-Look aside Buffer (TLB). Elucidate with a neat diagram the role of TLB in a simple paging system. | *CO3* | *PO2* | **10** |
| | | | **UNIT - V** | | | |
| | 9 | a) | Explain different file access methods. | *CO3* | *PO1* | **10** |
| | | b) | A disk drive has 250 cylinders, numbered 0 to 249. The drive is currently serving a request at cylinder 70. The queue of pending requests, in FIFO order is 60, 98, 183, 37, 122, 14, 124, 65, 67. Starting from the current head position, what is the total distance (in cylinders) that the disk arm moves to satisfy all the pending requests for each of the following disk-scheduling algorithms?<br>i. FCFS<br>ii. SCAN (Note: Disk arm moves towards left)<br>iii. C-SCAN | *CO4* | *PO3* | **10** |
| | | | **OR** | | | |
| | 10 | a) | Discuss the various file attributes and file operations in detail. | *CO3* | *PO1* | **10** |
| | | b) | Consider the following disk request sequence for a disk with 100 tracks 98, 137, 122, 183, 14, 133, 65, 78 Head pointer starts at 54 and moves in left direction. Show the total head movement for a 200 track disk (0-199) applying the following disk scheduling algorithms:<br>i)SCAN<br>ii)C-SCAN | *CO4* | *PO3* | **5** |
| | | c) | With a neat diagram outline the mechanism of a Hard Disk Drive (HDD). | *CO3* | *PO1* | **5** |



******