

[Time:2.30 Hrs]

[ Marks:75 ]

Please check whether you have got the right question paper.

- N.B:
1. All question are compulsory.
  2. Figures to the right indicate full marks.
  3. Students answering in the regional language should refer in case of doubt to the main text of the paper in English.

| Q.1     | <p><b>Attempt any FOUR of the following:</b></p> <ul style="list-style-type: none"><li>a. What are the services of an operating system?</li><li>b. Write a short note on the layered approach of operating system.</li><li>c. Define Single and multiprocessor systems. Write any 3 advantages of multiprocessor systems.</li><li>d. What is a system program? Explain its various categories.</li><li>e. Explain system calls with respect to definition, types and execution.</li><li>f. Explain Process Control Block and its role.</li></ul>   | 20           |                |              |    |   |   |    |   |   |    |   |   |    |   |   |    |   |   |    |   |   |   |   |   |   |   |   |   |   |  |   |   |   |   |    |   |   |   |   |    |   |   |   |   |    |   |   |   |   |    |
|---------|--|--------------|----------------|--------------|----|---|---|----|---|---|----|---|---|----|---|---|----|---|---|----|---|---|---|---|---|---|---|---|---|---|--|---|---|---|---|----|---|---|---|---|----|---|---|---|---|----|---|---|---|---|----|
| Q.2     | <p><b>Attempt any FOUR of the following:</b></p> <ul style="list-style-type: none"><li>a. Define the following terms with respect to CPU scheduling:<ul style="list-style-type: none"><li>i. CPU utilization</li><li>ii. Throughput</li><li>iii. Turnaround Time</li><li>iv. Wait Time</li><li>v. Response Time</li></ul></li><li>b. Write a short note on critical section problem.</li><li>c. Draw Gantt chart for FCFS and SRTF for the following and find average waiting time.</li></ul> <table border="1"><thead><tr><th>Process</th><th>CPU Burst Time</th><th>Arrival Time</th></tr></thead><tbody><tr><td>P1</td><td>7</td><td>0</td></tr><tr><td>P2</td><td>3</td><td>2</td></tr><tr><td>P3</td><td>5</td><td>2</td></tr><tr><td>P4</td><td>8</td><td>2</td></tr><tr><td>P5</td><td>7</td><td>3</td></tr><tr><td>P6</td><td>9</td><td>3</td></tr></tbody></table> <ul style="list-style-type: none"><li>d. Explain the 2 ways in which a process can recover from deadlocks.</li><li>e. Assume the following:</li></ul> <p><b>Available</b></p> <table border="1"><thead><tr><th>A</th><th>B</th><th>C</th><th>D</th></tr></thead><tbody><tr><td>3</td><td>1</td><td>1</td><td>2</td></tr></tbody></table> <p><b>Allocation</b></p> <table border="1"><thead><tr><th></th><th>A</th><th>B</th><th>C</th><th>D</th></tr></thead><tbody><tr><td>P1</td><td>1</td><td>2</td><td>2</td><td>1</td></tr><tr><td>P2</td><td>1</td><td>0</td><td>3</td><td>3</td></tr><tr><td>P3</td><td>1</td><td>2</td><td>1</td><td>0</td></tr></tbody></table> | Process      | CPU Burst Time | Arrival Time | P1 | 7 | 0 | P2 | 3 | 2 | P3 | 5 | 2 | P4 | 8 | 2 | P5 | 7 | 3 | P6 | 9 | 3 | A | B | C | D | 3 | 1 | 1 | 2 |  | A | B | C | D | P1 | 1 | 2 | 2 | 1 | P2 | 1 | 0 | 3 | 3 | P3 | 1 | 2 | 1 | 0 | 20 |
| Process | CPU Burst Time   | Arrival Time |                |              |    |   |   |    |   |   |    |   |   |    |   |   |    |   |   |    |   |   |   |   |   |   |   |   |   |   |  |   |   |   |   |    |   |   |   |   |    |   |   |   |   |    |   |   |   |   |    |
| P1      | 7  | 0            |                |              |    |   |   |    |   |   |    |   |   |    |   |   |    |   |   |    |   |   |   |   |   |   |   |   |   |   |  |   |   |   |   |    |   |   |   |   |    |   |   |   |   |    |   |   |   |   |    |
| P2      | 3  | 2            |                |              |    |   |   |    |   |   |    |   |   |    |   |   |    |   |   |    |   |   |   |   |   |   |   |   |   |   |  |   |   |   |   |    |   |   |   |   |    |   |   |   |   |    |   |   |   |   |    |
| P3      | 5  | 2            |                |              |    |   |   |    |   |   |    |   |   |    |   |   |    |   |   |    |   |   |   |   |   |   |   |   |   |   |  |   |   |   |   |    |   |   |   |   |    |   |   |   |   |    |   |   |   |   |    |
| P4      | 8  | 2            |                |              |    |   |   |    |   |   |    |   |   |    |   |   |    |   |   |    |   |   |   |   |   |   |   |   |   |   |  |   |   |   |   |    |   |   |   |   |    |   |   |   |   |    |   |   |   |   |    |
| P5      | 7  | 3            |                |              |    |   |   |    |   |   |    |   |   |    |   |   |    |   |   |    |   |   |   |   |   |   |   |   |   |   |  |   |   |   |   |    |   |   |   |   |    |   |   |   |   |    |   |   |   |   |    |
| P6      | 9  | 3            |                |              |    |   |   |    |   |   |    |   |   |    |   |   |    |   |   |    |   |   |   |   |   |   |   |   |   |   |  |   |   |   |   |    |   |   |   |   |    |   |   |   |   |    |   |   |   |   |    |
| A       | B  | C            | D              |              |    |   |   |    |   |   |    |   |   |    |   |   |    |   |   |    |   |   |   |   |   |   |   |   |   |   |  |   |   |   |   |    |   |   |   |   |    |   |   |   |   |    |   |   |   |   |    |
| 3       | 1  | 1            | 2              |              |    |   |   |    |   |   |    |   |   |    |   |   |    |   |   |    |   |   |   |   |   |   |   |   |   |   |  |   |   |   |   |    |   |   |   |   |    |   |   |   |   |    |   |   |   |   |    |
|         | A  | B            | C              | D            |    |   |   |    |   |   |    |   |   |    |   |   |    |   |   |    |   |   |   |   |   |   |   |   |   |   |  |   |   |   |   |    |   |   |   |   |    |   |   |   |   |    |   |   |   |   |    |
| P1      | 1  | 2            | 2              | 1            |    |   |   |    |   |   |    |   |   |    |   |   |    |   |   |    |   |   |   |   |   |   |   |   |   |   |  |   |   |   |   |    |   |   |   |   |    |   |   |   |   |    |   |   |   |   |    |
| P2      | 1  | 0            | 3              | 3            |    |   |   |    |   |   |    |   |   |    |   |   |    |   |   |    |   |   |   |   |   |   |   |   |   |   |  |   |   |   |   |    |   |   |   |   |    |   |   |   |   |    |   |   |   |   |    |
| P3      | 1  | 2            | 1              | 0            |    |   |   |    |   |   |    |   |   |    |   |   |    |   |   |    |   |   |   |   |   |   |   |   |   |   |  |   |   |   |   |    |   |   |   |   |    |   |   |   |   |    |   |   |   |   |    |

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|-----|--|----|---|---|---|---|----|---|---|---|---|----|---|---|---|---|----|---|---|---|---|--|
|     | <div>Max</div> <table><tr><td></td><td>A</td><td>B</td><td>C</td><td>D</td></tr><tr><td>P1</td><td>3</td><td>3</td><td>2</td><td>2</td></tr><tr><td>P2</td><td>1</td><td>2</td><td>3</td><td>4</td></tr><tr><td>P3</td><td>1</td><td>3</td><td>5</td><td>0</td></tr></table> <div>Using Banker's algorithm, answer the following questions:</div> <div><div><div>i.</div><div>How many resources of type A, B, C, D are there?</div></div><div><div>ii.</div><div>What are the contents of need matrix?</div></div><div><div>iii.</div><div>Find if the system is in safe state? If it is, find the safe sequence.</div></div></div> <div><div>f.</div><div>What are Semaphores? Explain their types.</div></div>  |    | A | B | C | D | P1 | 3 | 3 | 2 | 2 | P2 | 1 | 2 | 3 | 4 | P3 | 1 | 3 | 5 | 0 |  |
|     | A  | B  | C | D |   |   |    |   |   |   |   |    |   |   |   |   |    |   |   |   |   |  |
| P1  | 3  | 3  | 2 | 2 |   |   |    |   |   |   |   |    |   |   |   |   |    |   |   |   |   |  |
| P2  | 1  | 2  | 3 | 4 |   |   |    |   |   |   |   |    |   |   |   |   |    |   |   |   |   |  |
| P3  | 1  | 3  | 5 | 0 |   |   |    |   |   |   |   |    |   |   |   |   |    |   |   |   |   |  |
| Q.3 | <div>Attempt any FOUR of the following:</div> <div><div>a.</div><div>Write a note on Paging. (Use diagrams to explain your answer)</div></div> <div><div>b.</div><div>What are the different types of access methods of a file? Explain them in brief.</div></div> <div><div>c.</div><div>What is swapping? Explain in detail.</div></div> <div><div>d.</div><div>For the following page reference string calculate number of page faults with optimal and LRU page replacement algorithms. Frame size = 3.<br/>5 3 2 1 3 4 5 1 2 3 4 5 3 2 4</div></div> <div><div>e.</div><div>Write a note on SCAN and C-SCAN scheduling algorithms.</div></div> <div><div>f.</div><div>Disk request came into the disk driver for cylinder 53, 98, 183, 37, 122, 14, 124, 65, 67 in that order. Find total head movements for each of the following algorithm FCFS and SSTF.</div></div> | 20 |   |   |   |   |    |   |   |   |   |    |   |   |   |   |    |   |   |   |   |  |
| Q.4 | <div>Attempt any THREE of the following:</div> <div><div>a.</div><div>Write a note on Round-Robin algorithm.</div></div> <div><div>b.</div><div>What is deadlock? Explain necessary conditions required for a deadlock to occur.</div></div> <div><div>c.</div><div>State and explain various techniques of free space management.</div></div> <div><div>d.</div><div>Explain cooperating and non-cooperating processes</div></div> <div><div>e.</div><div>Write a note on Dining Philosophers' problem.</div></div> <div><div>f.</div><div>Discuss the following allocation algorithms:</div><div><div>i.</div><div>First fit</div></div><div><div>ii.</div><div>Best fit</div></div><div><div>iii.</div><div>Worst fit</div></div><div><div>iv.</div><div>Compaction</div></div><div><div>v.</div><div>External fragmentation</div></div></div>                            | 15 |   |   |   |   |    |   |   |   |   |    |   |   |   |   |    |   |   |   |   |  |