Total No. of Printed Pages: 2

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| PAPER CODE | U313- 294-ESE |
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**December 2023 (ENDSEM) EXAM**

**TY B. TECH (SEMESTER - I)**

**COURSE NAME: Operating System** **Branch: E&TC** **COURSE CODE:ETUA31204**

**(PATTERN 2020)**

**Time: [1Hr. 30 Min]** **[Max. Marks: 40]**

(*) Instructions to candidates:

1) **Figures to the right indicate full marks.**
2) **Use of scientific calculator is allowed**
3) **Use suitable data wherever required**
4) **All questions are compulsory. Solve any one sub question from Question 3 and any two sub questions each from Questions 4,5 and 6 respectively.**

<table>
<tr><th>Q. No.</th><th>Question Description</th><th>Max. Marks</th><th>CO mapped</th><th>BT Level</th></tr>
<tr><td>Q.1</td><td>a) Explain the concept of a multi-user operating system. How does it differ from a single-user system?</td><td>[2]</td><td>1</td><td>Knowledge</td></tr>
<tr><td>Q2</td><td>a) Compare and contrast preemptive and non-preemptive scheduling algorithms. What are the advantages and disadvantages of each?</td><td>[2]</td><td>2</td><td>Analyze</td></tr>
<tr><td>Q3.</td><td>a) Describe the challenges associated with scheduling processes on a multicore processor</td><td>[6]</td><td>3</td><td>Understand</td></tr>
<tr><td></td><td>b) Explain how spinlocks work and under what circumstances they are preferable over other synchronization mechanisms.</td><td>[6]</td><td>3</td><td>Knowledge</td></tr>
<tr><td>Q.4</td><td>a) Using a real-world example, illustrate how semaphores can be used to control access to a shared resource in IPC.</td><td>[5]</td><td>4</td><td>Apply</td></tr>
<tr><td></td><td>b) Compare and contrast the "Dining Philosophers Problem" with the "Producer-Consumer Problem" in terms of their requirements and solutions.</td><td>[5]</td><td>4</td><td>Analyze</td></tr>
<tr><td></td><td>c) Design a resource allocation graph for the information given below and justify with reasons whether the system deadlock free or not.
<table>
<tr><th rowspan="2">Process</th><th colspan="2">Allocation</th><th colspan="2">Request</th></tr>
<tr><th colspan="2">Resource</th><th colspan="2">Resource</th></tr>
<tr><th>R1</th><th>R2</th><th>R1</th><th>R2</th></tr>
<tr><td>P1</td><td>1</td><td>0</td><td>0</td><td>1</td></tr>
<tr><td>P2</td><td>0</td><td>1</td><td>1</td><td>0</td></tr>
<tr><td>P3</td><td>0</td><td>1</td><td>0</td><td>0</td></tr>
</table></td><td>[5]</td><td>4</td><td>Evaluate</td></tr>
<tr><td>Q.5</td><td>a) Evaluate the performance of the FIFO and LRU algorithms for a given reference string 1, 2, 3, 4, 5, 1, 2, 3, 4, 2 with 3 frames and recommend which algorithm is more suitable for minimizing page faults.</td><td>[5]</td><td>5</td><td>Evaluate</td></tr>
</table>

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| | b) Define segmentation and explain its role in memory management. List the primary advantages of using virtual memory in operating systems. | [5] | 5 | Understand |
| | c) Apply the concept of demand paging to a real-world example in an operating system. | [5] | 5 | Apply |
| Q.6 | a) Evaluate the impact of "Free-Space Management" strategies on the efficiency of a file system, considering aspects like fragmentation and performance. | [5] | 6 | Evaluate |
| | b) Consider a disk with 200 tracks and the queue has random requests from different processes in the order:<br>55, 58, 39, 18, 90, 160, 150, 38, 184<br>Initially arm is at 100. Compute the Average Seek length using SCAN algorithm. | [5] | 6 | Evaluate |
| | c) Consider a disk queue with requests for I/O to blocks on cylinders 98, 183, 41, 122, 14, 124, 65, 67. The LOOK scheduling algorithm is used. The head is initially at cylinder number 53 moving towards larger cylinder numbers on its servicing pass. The cylinders are numbered from 0 to 199. Compute the total head movement (in number of cylinders) incurred while servicing these requests is? | [5] | 6 | Evaluate |