[ECS 704]  
M.Tech. Degree Examination  
Computer Science & Technology  
II SEMESTER  
REAL TIME SYSTEMS  
(Effective from the admitted batch 2015–16)  
Time: 3 Hours  
Max.Marks: 60

Instructions:  
Each Unit carries 12 marks. 
Answer all units choosing one question from each unit. 
All parts of the unit must be answered in one place only. 
Figures in the right hand margin indicate marks allotted.

MODULE-I

1. a) Explain the important differences between hard, firm and soft real time systems  
   
   b) It is difficult to achieve software fault tolerance as compared to hardware fault tolerance. Why? 

   OR

2. Identify the key differences between hard real-time, soft real-time, and firm real-time systems. Give at least one example of real-time tasks corresponding to these three categories. Identify the timing constraints in your tasks and justify why the tasks should be categorized into the categories you have indicated

MODULE-II

3. a) What are the distinguishing characteristics of periodic, aperiodic and sporadic real time tasks

   b) Can we consider EDF as a dynamic priority scheduling algorithm for real time tasks?
4. Consider a real-time system which consists of three tasks $T_1$, $T_2$ and $T_3$, which have been characterized in the following table.

<table>
<thead>
<tr>
<th>Task</th>
<th>Phase (ms)</th>
<th>Execution Time (ms)</th>
<th>Relative Deadline (ms)</th>
<th>Period (ms)</th>
</tr>
</thead>
<tbody>
<tr>
<td>$T_1$</td>
<td>20</td>
<td>10</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>$T_2$</td>
<td>40</td>
<td>10</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>$T_3$</td>
<td>70</td>
<td>20</td>
<td>80</td>
<td>80</td>
</tr>
</tbody>
</table>

If the tasks are to be scheduled using a table-driven scheduler, what is the length of time for which the schedules have to be stored in the precomputed schedule table of the scheduler?

**MODULE-III**

5. a) Explain priority inversion in the context of real time scheduling  
   b) Can PIP and PCP be considered as greedy algorithms

**OR**

6. What do you understand by *inheritance-related inversion*? Explain how it can arise when resources are shared in exclusive mode in a real-time environment. Can inheritance-related inversion be eliminated altogether? If your answer is “yes”, explain how? If your answer is “no”, then explain how can inheritance-related inversions be contained?

**MODULE-IV**

7. Why allocating of tasks in a multiprocessor environment is difficult. Compare buddy schemes and bidding schemes in context to dynamic allocation of task

**OR**

8. a) Explain with example challenges associated with Communication in a real-time system  
   b) Which type of LAN architecture is suitable for real-time Communication
MODULE-V

9. a) Explain how a real-time database differs from a conventional database 6
   b) Explain a few practical applications requiring the use of a real-time database 6

OR

10. For real-time applications, rank 2PL, SCC, and OCC protocols in terms of the percentage of transactions meeting their deadlines. Consider low and high degrees of conflicts among transactions, and tight and lax transaction deadlines. Give a brief reasoning behind your answer 12

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