Course Code:12M1WEC232   Max. Marks: 25
Course Name: Real-Time Embedded Systems   Max. Time: 1.5 HR.

Note: All questions are compulsory. Carrying of mobile phone during examination will be treated as case of unfair means. Marks are indicated below each question

Q-1: a) What do you mean by a Byzantine clock? Explain with giving example.

[3]

b) Prove that –

" *In a distributed system with n clocks, a single Byzantine clock make two arbitrary clocks in a system to differ by $\dfrac{3\varepsilon}{n}$ in time value, where ε represents the maximum permissible drift between two clocks.*"

[2]

Q-2: a) Assume that a drift between any two clocks is restricted to $\rho = 15 \times 10^{-6}$. Suppose we want to implement a synchronized set of six distributed clocks using the central synchronization scheme so that the maximum drift between any two clocks is restricted to $\varepsilon = 3\ mSec$ at any time, determine the period with which the clocks needs to be resynchronized.

[2]

b) What is need of clock synchronization in distributed system? Explain different types of synchronization scheme.

[3]

Q-3: a) Explain the concept of priority inversion and unbounded priority inversion.

[2.5]

b) Prove that –
"*When HLP (Highest Locker Protocol) is used for resource sharing, once a task gets a resource required by it, it is not blocked any further.*"

[2.5]

Q-4: a) Determine a feasible schedule for real-time tasks of task set {$T_1, T_2, \ldots, T_5$} for which the precedence relations have been shown in graph shown below for use with a table-driven scheduler. The execution times of the tasks $T_1, T_2, \ldots, T_5$: 7, 10, 5, 6, 2 and the corresponding deadlines are 40, 50, 25, 20, 8 respectively.

[3]
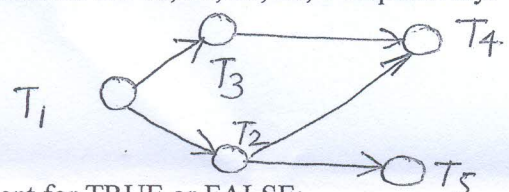
b) Justify the following statement for TRUE or FALSE:
"*Rate monotonic scheduling can satisfactorily be used for scheduling access of several hard real-time periodic tasks to a certain shared critical resource.*"

[2]

Q-5: a) Explain precedence relation among the tasks with the help of an example.

[2]

b) Discuss various aspects of achieving high reliability among the real-time systems.   [3]