

Registration no:

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M.TECH  
EIPE207

**Second Semester Examination – 2013**

**REAL TIME INSTRUMENTATION**

**Time: 3 Hours  
Max marks: 70**

Answer Question No.1 which is compulsory and any five from the rest.

The figures in the right hand margin indicate marks.

Q1 Answer the following questions: (2 x 10)

State whether the following statements are **TRUE or FALSE**. In each case, justify your answer using one or two sentences. Irrelevant and unnecessarily long answers will be penalized.

- (a) Static priority task scheduling algorithms incur less run time overhead compared to the dynamic priority task scheduling algorithms.
- (b) Memory locking is a technique supported by many real-time operating systems to help tackle the deadlock problem.
- (c) Real-time communication and fast communication are synonymous.
- (d) Cyclic schedulers should be used when a real-time time application consists of a mixture of statically and dynamically created tasks.
- (e) Static priority task scheduling algorithms incur less run time overhead compared to the dynamic priority task scheduling algorithms.
- (f) Memory locking is a technique supported by many real-time operating systems to help the application program tackle the deadlock problem.
- (g) Propagation delay primarily determines the end-to-end delay that a message might suffer while being transferred over an internetwork.
- (h) A good real-time computer communication technique is essentially any fast communication technique
- (i) Finding an optimal schedule for a set of independent periodic hard real-time tasks without any resource-sharing constraints under static priority condition can be shown to be an NP-complete problem.
- (j) Priority Inheritance Protocol (PIP) suffers from unbound priority inversion problem.

Q2 a) Identify the key difference 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. (5)

b) What do you understand by the "fail-safe" state of a system? Safety-critical real-time applications do not have a fail-safe state. What is the implication of this? (5)

Q3 a) Why is selection of an appropriate concurrency control protocol important to meet the timeliness requirements for transactions? Explain the different categories of concurrency control protocols that can be used in real-time database. (5)

b) Define the terms priority inversion unbound priority inversion as used in real-time operating systems. (5)

- Q4 a) Explain why is debugging and testing real-time software difficult? (5)  
b) What are the different types of timing constraints that can occur in a real-time system? Give examples of each. (5)

- Q5 a) Why is it necessary to synchronise the clocks in a distributed real-time system? Discuss the relative advantages and disadvantages of the centralized and distributed clock synchronisation schemes. (5)  
b) Briefly explain salient features of any popular real-time operating system such as RT-Linux or Windows CE. (5)

- Q6 a) Why does the presence of Byzantine faults makes clock synchronization problem difficult? What is the minimum number of clocks necessary to ensure proper synchronization in the presence of 'm' Byzantine faults? (5)  
b) Explain the difference between traffic shaping and policing. Name a traffic shaping and policing protocol and briefly describe its operation

- Q7 a) What is POSIX ? what are the specific requirements of POSIX-RT for real-time operating system . (5)  
b) Distinguish between the followings : (5)  
i) Priority Inheritance protocol (PIP) Vs. Highest Locker Protocol(HLP)  
ii) Soft real-time communication Vs. Hard real time communication

- Q8 Describe any TWO from the following (5+5=10)  
a) Rate monotonic algorithm (RMA)  
b) POSIX  
c) QoS framework