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M.TECH
CSPE101

1st Semester Regular/Back Examination – 2014
REAL TIME SYSTEM
BRANCH(S): COMPUTER SCIENCE AND ENGINEERING,COMPUTER SCIENCE,INFORMATION TECHNOLOGY

Time: 3 Hours
Max Mmarks: 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: (2x10)

a) What is Task Criticality? Why is it important to consider task criticality while designing Fault tolerant system?
b) What are the various methods used to achieve hardware fault tolerance?
c) Differentiate between simple priority inversion and unbounded priority inversion.
d) What are the two main purpose of using clocks in distributed real time system?
e) Differentiate between byzantine clock and bad clock.
f) What are the activities performed by handler routine when a clock interrupt occurs?
g) What are the various real time priority levels associated with UNIX based RTOS?
h) Define MIPS. What are the drawbacks of MIPS while determining the rating of a computer?
i) What is tridimensional measure? How it is calculated?
j) Define absolute validity and relative consistency in the context of temporal consistency of data. Write the condition for both.

Q2 a) What is the difference between performance constraint and Behavioral constrain? Describe the various types of timing constrains with suitable example. (6)

b) Explain the operation of Priority Ceiling Protocol in sharing critical resources among real-time task. Explain different types of priority inversions that a task might suffer due to a lower priority task when the PCP is used to share critical resources among a set of real time task. (4)

Q3 a) Explain the conditions for a set of periodic real time task to be schedulable under EDF and RMA. Prove that a set of periodic real time task is RMA schedulable under any task phasing, if all the tasks met their respective first deadlines under zero phasing. (6)

b) What is synthetic benchmark? Discuss the parameters used in Rhealstone metric for benchmarking the Real-Time Systems. (4)

Q4 a) What is cyclic scheduler? How it differs from table driven scheduler? Discuss the important constraints that a selected frame size must satisfy in cyclic scheduling. Prove that minimum separation of the task arrival from corresponding frame start time considering all instances of a task ti is equal to GCD (F, P_i). (6)

b) A cyclic real time scheduler is to be used to schedule three periodic task T1, T2, T3 with following characteristics: (4)

Task	Phase	Execution Time	Relative Deadline	Period
T1	0	20	100	100
T2	0	20	80	80
T3	0	30	150	150

Suggest a suitable frame size that can be used. Show all intermediate steps in your calculation.

Q5 a) Why traditional Unix kernel is not suitable to be used in a multiprocessor environment? Explain how Unix dynamically recomputes task priority values. (5)

b) Explain how interrupts are handled in Windows NT. How the interrupt processing scheme of Windows NT makes it unsuitable for hard real time applications. (5)

Q6 a) What do you understand by QoS Routing? What are the different QoS constraints that are considered during QoS routing? Explain different types of QoS routing Algorithms. (6)

b) Describe two bounded access protocols that support real time communication in LAN. (4)

Q7 a) What is the role of a concurrency control protocol in a database? Why is selection of an appropriate concurrency control protocol important to meet the timeliness requirements for transactions? Explain Optimistic Concurrency control protocol and speculative concurrency control protocol used in real time databases. (6)

b) Why traditional 2 phase locking based concurrency protocol may not be suitable for use in real time databases? Explain how the traditional 2PL protocol can be extended to make it suitable for use in real time database application. (4)

Q8 Write Short Notes (2.5x4)

a) Software fault Tolerance Techniques
b) Event Driven Scheduling
c) Priority Inheritance Protocol
d) POSIX