Registration No : | | | | | | | | | | |

Total Number of Pages: 02 **B.Tech.**
PCS5D001

5th Semester Regular Examination 2018-19
REAL TIME SYSTEMS
BRANCH : CSE
Time : 3 Hours
Max Marks : 100
Q.CODE : E554

Answer Question No.1 (Part-1) which is compulsory, any eight from Part-II and any two from Part-III.
The figures in the right hand margin indicate marks.

Part-I

Q1 **Short Answer Type Questions (Answer All-10)** **(2 x 10)**

a) What is BIST?
b) Differentiate between hard real-time tasks and soft real-time tasks.
c) Differentiate between stimulus events and response events.
d) How is deadlock avoided in PCP?
e) What is the difference between PIP and HLP?
f) Why clock synchronization is required?
g) Differentiate between periodic timers and aperiodic timers.
h) What are the shortcomings of Windows NT?
i) Specify the important parts of the POSIX standard.
j) What do you understand by Rhealstone metric?

Part-II

Q2 **Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve)** **(6 x 8)**

a) Explain a basic model of a real-time system with a neat sketch diagram.
b) Explain why safety and reliability are not independent issues in safety-critical hard real-time systems. Explain the basic techniques you would adopt to develop a software product that is required to be highly reliable.
c) What is the difference between a performance constraint and a behavioral constraint in a real-time system? Give practical examples of each type of constraint.
d) A cyclic scheduler is to be used to run the following set of periodic tasks on a uniprocessor: $T_1 = (e_1 = 1, p_1 = 4)$, $T_2 = (e_2 = 1, p_2 = 5)$,$T_3 = (e_3 = 1, p_3 = 20)$,$T_4 = (e_4 = 2, p_4 = 20)$. Select an appropriate frame size. Note that e_i is the execution time and p_i is the period of a periodic task T_i.
e) Check whether the following set of three periodic real-time tasks is schedulable under RMA on a uniprocessor: $T_1 = (e_1 = 20, p_1 = 100)$,$T_2 = (e_2 = 30, p_2 = 150)$,$T_3 = (e_3 = 90, p_3 = 200)$.
f) Explain the important features of a real-time operating system.
g) Differentiate between centralized clock synchronization and distributed clock synchronization.
h) Briefly indicate how Unix dynamically recomputes task priority values. Why is such recomputation of task priorities required? What are the implications of such priority recomputations on real-time application development?
i) Explain why algorithms that can be used satisfactorily to schedule real-time tasks on multiprocessors often are not satisfactory to schedule real-time tasks on distributed systems and vice-versa?

j) Identify the factors which contribute to delay jitter in real-time communications in packet-switched networks. Assume that a certain real-time application receives data at the rate of 10Mbps. The QoS guarantee to the application permits a delay jitter of 20mSec. Compute the buffer requirement at the receiver.

k) What is the difference between synchronous I/O and asynchronous I/O? What are the implications of these two types of I/O for real-time applications?

l) How the execution of concurrent transactions can be controlled in a real-time system? Explain 2PL-WP and 2PL-HP protocols used in real-time databases.

Part-III

Long Answer Type Questions (Answer Any Two out of Four)

Q3 Explain the difference between clock-driven, event-driven and hybrid schedulers for real-time tasks. Which type of scheduler would be preferred for scheduling three periodic tasks in an embedded application? Justify your answer. **(16)**

Q4 A set of hard real-time periodic tasks need to be scheduled on a uniprocessor using RMA. The following table contains the details of these periodic tasks and their use of three non-preemptable shared resources. Can the tasks T2 and T3 meet their respective deadlines when the priority ceiling protocol is used for resource scheduling? **(16)**

Task	p_i	e_i	R1	R2	R3
T_1	400	30	15	20	-
T_2	200	25	-	20	10
T_3	300	40	-	-	-
T_4	250	35	10	10	10
T_5	450	50	-	-	5

p_i indicates the period of task T_i and e_i indicates its computation time. The period of each task is the same as its deadline. The entries in the R1, R2 and R3 columns indicate the time duration for which a task needs the named resource in non-preemptive mode. Assume that after a task releases a resource, it does not acquire the same or any other resource.

Q5 Explain the operation of the priority ceiling protocol in sharing critical resources among real-time tasks. Explain how PCP is able to avoid unbounded priority inversion and chain blockings? Explain different types of priority inversions under PCP. **(16)**

Q6 **Write short notes on :** **(16)**

a) Real-time communication over packet switched networks

b) POSIX-RT

c) Commercial real-time databases

d) Benchmarking real-time systems.