Registration no:

Total Number of Pages: 02

B.Tech
PECS5403

7^{th} Semester Regular / Back Examination 2016-17
REAL TIME SYSTEMS
BRANCH: CSE, IT, ITE
Time: 3 Hours
Max Marks: 70
Q.CODE: Y357
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)**

a) What do you understand by laxity of a task?
b) Can PIP and PCP be considered as greedy algorithms? Explain.
c) How task scheduling techniques can be used to achieve effective fault-tolerance in real time systems?
d) What is chain blocking? How is unbounded priority inversion avoided in PCP?
e) Why multiprocessor systems are called tightly coupled systems whereas, distributed systems are called loosely coupled systems?
f) Distinguish between execution time and response time of a task?
g) What do you understand by semaphore shuffling time?
h) Differentiate between synchronous and asynchronous I/O? Which one is better suited for use in real-time applications?
i) Explain why 2PL-WP protocol is not free from deadlocks.
j) List the essential differences between a real-time database and a conventional database?

Q2 **a)** What is a “fail-safe” state of a system? Since safety-critical systems do not have a fail-safe state, how is safety guaranteed? **(4)**

b) List the different types of timing constraints that can occur in a real-time system? **(2 + 4)**
Construct the EFSM of a telephone system whose behavior is described as follows:

> If you press the button of the handset for less than 15 sec, it connects to the local operator. If you press the button for any duration lasting between 15 sec to 30 sec, it connects to the international operator. If you keep the button pressed for more than 30 sec, then on releasing it would produce the dial tone.

Q3 **a)** The following table shows the details of tasks in a real-time system. The tasks have zero phasing and repeat with a period of 90 mSec. Determine a feasible schedule to be used by a table-driven scheduler. **(4)**

Tasks	Execution time (in mSec)	Deadline (in mSec)	Dependency
T_1	30	90	—
T_2	15	40	T_1, T_3
T_3	20	40	T_1
T_4	10	70	T_2

b) A cyclic scheduler is used to run the following set of periodic tasks. Assume a single processor is present in the system and all timings are given in msec. Select the appropriate frame size. **(6)**
($e_1 = 1$, $p_1 = 4$), ($e_2 = 2$, $p_2 = 5$), ($e_3 = 5$, $p_3 = 20$)

Q4 a) In a distributed system with six clocks, the maximum difference between any two clocks is 10 mSec. The individual clocks have a maximum drift rate of 2×10^{-6}. Ignoring clock setup times and communication latencies, determine the rate at which the clocks need to re-synchronize using a simple central time server method? **(4)**

b) A set of real-time periodic tasks need to be scheduled on a uni-processor using RMA. The following table contains the details of these periodic tasks and their use of non-preemptable shared resources. Can the tasks T_2 and T_3 meet their respective deadlines when priority ceiling protocol is used for resource scheduling? R_1, R_2 and R_3 entries indicate the time duration for which a task needs the named resource in non-preemptive mode. **(6)**

Tasks	Period p_i (in mS)	Exec. time e_i (in mS)	R_1	R_2	R_3
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

Q5 a) Why is dynamically changing the priority levels of tasks important for traditional operating systems? How does this property affect real-time systems? **(4)**

b) Evaluate the suitability of Windows-NT as a Real-time OS. **(6)**

Q6 a) Trace the crucial features for a real-time operating system to possess. **(4)**

b) Discuss the various features of Global priority based protocol, Calendar based protocol and Bounded access protocol for hard real-time communication in a LAN. **(6)**

Q7 a) Why traditional 2PL is not suitable for use in real-time databases? **(4)**

b) Briefly discuss at least three optimistic concurrency control protocols used in real-time databases. **(6)**

Q8 Write short answer on any TWO: **(5 x 2)**

a) Host-Target approach

b) IEEE 802.5

c) PSOS