

## MANIPAL INSTITUTE OF TECHNOLOGY MANIPAL A Constituent Institution of Manipal University

# SEVENTH SEMESTER B.TECH. (INSTRUMENTATION AND CONTROL ENGG.) END SEMESTER EXAMINATIONS, NOV - 2017

## SUBJECT: REAL TIME EMBEDDED SYSTEMS [ICE 4003]

Time: 3 Hours

#### MAX. MARKS: 50

### **Instructions to Candidates:**

✤ Answer ALL the questions.

• Missing data may be suitably assumed.

- 1A. Using the revenue model, derive the percentage revenue loss equation for any rise angle, rather than for 45 degrees.
- **1B.** Define different main processor technologies and list the benefits of using each of the processor technologies?
- 1C. What are the main characteristics of embedded systems that distinguish them from other computing systems?
- 2A. Describe Electrically Erasable Programmable ROM and One Time Programmable ROM.
- **2B.** With relevant figures brief about the testing and debugging process in a real time embedded system.
- 2C. The design of a particular disk drive has an NRE cost of \$100,000 and a unit cost of \$20. How much has to be added to the cost of each product to cover NRE cost, assuming (a) 100 units, and (b) 10,000 units are sold.
- 3A. With block diagram explain high level language to machine language conversion process. What are the advantages and limitations of high level language based development?
- **3B.** Illustrate Finite State Machine model for a seat belt warning system with necessary figures.
- **3C.** Assume that the drift between any two clocks is restricted to  $\rho = 5*10^{-6}$ . 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  $\varepsilon = 1$ ms at any time, determine the period with which the clocks need to be resynchronized.
- **4A.** Describe the multithreading process. List the advantages of using multiple threads.
- **4B.** Three processes with process IDs P1, P2, P3 with estimated completion time 10, 5, 7

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4

milliseconds respectively enters the ready queue together in the order P1, P2, P3 (Assume only P1 is present in the 'Ready' queue when the scheduler picks it up and P2, P3 entered 'Ready' queue after that). Now a new process P4 with estimated completion time 6 ms enters the 'Ready' queue after 5 ms of scheduling P1. Calculate the waiting time and Turn Around Time for each process and the Average waiting time and average Turn Around Time using Last Come First Served Scheduling algorithm.

4C.	Define Job Queue and Device Queue.	2
5A.	Briefly explain IEEE 802.4 protocol.	4
5B.	Describe RETHER protocol.	4
5C.	Explain calendar based protocol used in hard real time communication in a LAN.	2

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