MANIPAL INSTITUTE OF TECHNOLOGY
MANIPAL
(A constituent unit of MAHE, Manipal)

SIXTH SEMESTER B.Tech. (E & C) DEGREE END SEMESTER EXAMINATION
APRIL/MAY 2018
SUBJECT: EMBEDDED SYSTEM DESIGN (ECE - 4003)

TIME: 3 HOURS   **MAX. MARKS: 50**

Instructions to candidates
- Answer **ALL** questions.
- Missing data may be suitably assumed.

1A.   Define various operational quality attributes of the embedded system.

1B.   Explain the three following key technologies for embedded systems
  i.   Processor technology
  ii. IC technology
  iii. Design technology

1C.   What is NRE cost?. Create a graph with the x-axis the number of units and y-axis the product cost. Plot the per-product cost function for an NRE cost of $50,000 and a unit cost of $5.

(5+3+2)

2A.   With neat diagram, explain the interfacing of seven segment display device's to a typical microcontroller in static and dynamic ways. Explain which way is advantageous to reduce power consumption.

2B.   Draw the power on reset circuitry for a typical microcontroller. Explain why it is required.

2C.   What is watch dog timer? Explain its significance in embedded systems.

(5+3+2)

3A.   Explain the four ways in which the data can be transferred in USB protocol.

3B.   List out Kernel services of Real Time Operating System and explain them briefly

3C.   Explain the following terms of OS scheduling
  i.   Starvation
  ii. Priority Inversion

(5+3+2)

4A.   Explain the Concurrent/communicating process model of embedded system with 'Seat belt warning system' example. The requirements of seat belt warning system are
       i). When the vehicle ignition is turned on and the seat belt is not fastened within 10 seconds of ignition ON, the system generates an alarm signal for 5 seconds.
       ii). The Alarm is turned off when the alarm time(5 seconds) expires or if the driver/passenger fastens the belt or if the ignition switch is turned off, whichever happens first.

4B. Three processes with process IDs P1, P2, P3 with estimated completion time 10, 5, 7 milliseconds respectively enters the ready queue together. A new process P4 with estimated completion time 2ms enters the 'Ready' queue after 4ms. Calculate Waiting time, turn-around time, average waiting time and average turn-around time. Assume all the processes contain only CPU operation and no I/O operations are involved. Use non-preemptive SJF scheduling.

4C. Draw the data flow graph for the equation used to find area and circumference of a circle.

(5+3+2)

5A. Write differences between the following:
       i) Development Processor and Target Processor
       ii) Compiler and Cross-Compiler
       iii) Assembler and Cross-Assembler
       iv) Debugger and Emulator
       v) Out-of-circuit programming and In System Programming of target board

5B. What is EDLC? What is its significance? List out its objectives.

5C. List out the typical storage classes those an embedded C compiler must support to take the advantage of 8051 microcontroller.

(5+3+2)