B.E (ETRX) . SEM VIII (OLD) , 30/05/17

Q.P.Code:11639

(Old Course)

Duration: 3 Hours   **Total Marks: 100**

N.B.   (1) Question No. 1 is compulsory
        (2) Attempt any four out of remaining six questions.
        (3) Assume suitable data with proper justification.

Q1.   a) Describe different modes of ARM7   5
       b) Draw and explain CAN frame format.   5
       c) What are the functions/roles of RTOS in a system.   5
       d) What is significance of design metric in an embeded system design ? 5

Q2.   a) What is black and white box testing? Compare.   5
       b) Explain modifiers in c and their usages in an embeded system.   5
       c) Compare Assembly and C-programing.   5
       d) Compare different kind of memory like EEPROM, FLASH, RAM, OTPROM.   5

Q3.   a) Draw an FSM/Petrinet for an ATM   system.   10
       b) Design a visitor counter system. Draw simple circuit diagram.
          (component values not required)   10

Q4.   a) What is priority inversion problem?
          How unbounded priority inversion problem can be solved?   10
       b) Determine if following tasks can be scheduled if scheduled according to their period 10

Task	Period	Execution time	Dead line
T1	56	11	56
T2	28	4	28
T3	14	10	14

Q5.   a) Compare MSP430 architecture with ARM7.   10
       b) Describe exceptions of ARM.   10

Q6.   Design an embedded system for robotic colouring machine. It should colour surface in
       appropriate manner. It should sense viscosity of colour and add thinner accordingly.   20
          i) Draw Block diagram represeping hardware,
          ii) Identify the design metric/constraints/challenges,
          iii) Model the functioning of the system using FSM/Petrinet/Flowchart,etc,
          iv) Select the components with justification, for the system.

Q7.   Write short notes on   20
       a) Inter task communication.
       b) RS485 communication.
       c) System on Chip (SOC).

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24/5/17

(3 Hours)   **Total Marks : 100**

Note :1) Question **no. 1** is **compulsory**
    2) Solve **any four** from the remaining **six** questions.
    3) Assume suitable additional data if necessary.

1. a) Explain how parabolic blends eliminate infinite acceleration points on the trajectory of robots.   **5**
   b) Why dexterous work envelope is always smaller than the total work envelope   **5**
   c) Explain the why Inverse kinematics solution is not unique for generic robots   **5**
   d) What is the tool configuration vector? Explain its role in the solution of an inverse kinematic problem   **5**

2. a) Draw LCD Diagram of SCARA Robot and mark all Kinematic parameters w.r.t each joint And Obtain Arm Matrix for SCARA robot?   **10**
   b) Find the joint position of the tool tip of the Adept One robot when the joint variables are q = $[\Pi/4, -\Pi/3, 120, \Pi/2]^T$ Where d =[877, 0.0, d3, 200]^T a =[425, 375, 0.0, 0.0]^T **10**

3. a) What is the different between Path & Trajectory? Explain Trajectory planning?   **10**
   b) Explain the bounded deviation algorithm for straight line motion of the tool path.   **10**

4. a) Explain robot pick-and-place operation.   **10**
   b) Explain role of line and area descriptors for analyzing shape of an object.   **10**

5. a) Explain linear interpolation with parabolic blends. Discuss its advantages over piecewise linear interpolation.   **10**
   b) Explain template matching technique for part recognition   **10**

6. (a) Explain shrink and swell operators with an example.   **10**
   (b) What are advantages of PLC's explain with examples, also state the specifications of PLC with Industrial application and manufacturer.   **10**

7. Write notes on the following: **20**
   (a) Robot specification
   (b) Gross motion planning
   (d) Task planner simulation
   (e) Link co-ordination arm equation