(3 Hours)   **[Total Marks: 80]**

N.B.: (1) Question No. 1 is **Compulsory**.

    (2) Attempt any **three** questions out of the remaining **five**.

    (3) Each question carries 20 marks and sub-question carry equal marks.

    (4) Assume suitable data if required.

1.   Solve **any 4**

     (a)   Compare I2C and CAN communication protocol.   (5)

     (b)   Discuss difference between RISC and CISC cores.   (5)

     (c)   Draw the diagram to explain various task states.   (5)

     (d)   Examine the significance of Task Control Block.   (5)

     (e)   Explain Hardware Software co-design in embedded systems.   (5)

2.   (a)   Explain the following terms w.r.t Embedded systems: Code Density, Memory protection, power consumption and speed.   (10)

     (b)   Draw architecture of the ARM Cortex-M3 and discuss its registers of all types.   (10)

3.   (a)   Explain various types of testing used in embedded system design in detail.   (10)

     (b)   Draw and explain Spiral model used in embedded product design life cycle (EDLC)   (10)

4.   (a)   Elaborate all the functions of RTOS kernel.   (10)

     (b)   Examine the low power modes in ARM CORTEX M3   (10)

5   (a)   Discuss Semaphores and Mutex. Explain the functions to implement the same in any RTOS you know.   (10)

     (b)   Decide whether the tasks are schedulable by Necessary and sufficient condition in an embedded system with 4 different tasks with task IDs T1, T2, T3, T4 and estimated completion time 12, 8,10,5 mS respectively. T1, T2, T3 and T4 have their cycle duration as 30, 40, 50 and 60 ms respectively. Schedule them by Rate Monotonic Scheduling method.   (10)

6.   (a)   Explain the following FreeRTOS API functions xTaskCreate(), vTaskDelay(), vTaskGetInfo(), vTaskPrioritySet()   (10)

     (b)   Design a suitable program model to design seat belt warning system for a four wheeler.   (10)

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