

(3 Hours)

[Total Marks: 80]

N.B : (1) Question No.1 is compulsory.

(2) Attempt any three questions from remaining questions.

(3) Figures to the right indicate full marks.

Q1) Answer any Four

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- What are the different Types of Tasks in a Real Time System? Give suitable Examples.
- Differentiate between SPI and I2C Bus.
- Give the significance of Watch Dog Timer for a given application.
- Explain the Design Metrics of an Embedded Systems.
- Draw the Data flow Graph for

$$y = \sqrt{a^2 + b^2} \quad \text{and} \quad z = \frac{(ab+cd)}{2}$$

Q2) a) Explain the CAN Bus Protocol. How it is suitable for Real Time applications.

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b) Explain the Task State Diagram. What is a Task Control Block.?

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Q3) a) What is Priority Inversion, Unbounded Priority Inversion .

Give the Solution to overcome it.

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- Give the Utilization bound for Rate Monotonic Scheduling Algorithm and find if the following Task Set is $T_i(e_i, P_i)$ RMA schedulable.

Show using Time Line Diagram. $T_1: (1,4)$, $T_2(2,5)$ $T_3(5,20)$

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Q4) a) What type of Real Time System is a “Air Bag Deployment Unit in a Car.”.

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Write suitable PseudoCodes using MicroCOS/II functions OSInit(), OSStart(), OSFlagCreate(), OSFlagPost() OSFlagPend().

Consider **Task1**: Detects Accident

Task2: Deploys Air bag on detection of Accident. Explain the operation of each

MicroCOS/II function used.

- Explain the Earliest Deadline First Scheduling Algorithm. State its Advantages and Disadvantages.

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Q5) Design a Automatic Chocolate Vending Machine.Support the Design using

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- a) Requirements b) Specifications c) Hardware /Software Architecture
- e) Testing /Debugging and System Integration.
- f) Use suitable MicroCOS/II functions.

Q6)Write Short Notes on **any 2**

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- a)White Box and Black Box Testing, On chip Debugging.
- b)Hardware Software Co-Design Issues
- c)OSTaskCreate(),OSQPost(),OSQPend(),OSSemPost(),OSSemPend()
- d)Bluetooth /Zigbee
- e)Sensors and Actuators