

(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

20

- a) What are the different Types of Tasks in a Real Time System? Give suitable Examples.
- b) Differentiate between SPI and I2C Bus.
- c) Give the significance of Watch Dog Timer for a given application.
- d) Explain the Design Metrics of an Embedded Systems.
- e) 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. 10

b) Explain the Task State Diagram. What is a Task Control Block.? 10

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

Give the Solution to overcome it. 10

b) 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. $T_1: (1,4)$, $T_2(2,5)$ $T_3(5,20)$ 10

Q4) a) What type of Real Time System is a “Air Bag Deployment Unit in a Car.”. 10

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.

b) Explain the Earliest Deadline First Scheduling Algorithm. State its Advantages and Disadvantages. 10

Q5) Design a Automatic Chocolate Vending Machine.Support the Design using 20

- 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** 20

- 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