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

(1) Question 1 is compulsory.
(2) Attempt any **three** from the remaining questions.
(3) Draw neat diagrams wherever necessary.

Q1. Answer the following questions: Any 4

a) Justify the need for brown-out detection circuit in embedded systems and the mechanism of implementing the same. (5)

b) What is a Dead Lock State for an embedded system? Give the Types of Deadlock (5)

c) Compare the use of Macros and Functions in terms of Speed and Memory space. (5)

d) What are interrupts and explain the factors that contribute to interrupt response time in a system. (5)

e) Draw the Data Flow Graph for the following

$$y=\frac{\sqrt{a+b}}{c^2}$$ (5)

Q2 (a) Design a Coffee vending machine, for this develop. (20)

- FSM which describes the functioning of the system,
- Requirements /Specifications
- Hardware block diagram
- List of components with justification
- Design challenges and suggest solutions

Q3 (a) What is an inter process communication? Explain the various IPCs mechanisms used in MicroCOS/II. (12)

Q3 (b) Find whether the following Task Set is RMA schedulable
Ti(ei,pi): T1: (1,4) , T2(2,6) T3(3,8) (8)

Compare RMA and EDF Scheduling Algorithms

Q4(a) Compare black box and white box testing. Explain any one On Chip Debugging Technique (10)

Q4 (b) Explain CAN bus Protocol in detail w.r.t features, Applications etc. (10)

Q5 (a) Explain in Detail Design metrics for an embedded system. Which are the tightly constrained metrics , comment (10)

Q5(b) What is a task and various states that a task can lie in for an embedded environment. Explain Context Switching Process. (10)

Q 6. Write a short note on any 2 **(20)**

a) Watch Dog Timer
b) Sensors & Actuators used in Embedded System
c) Priority Ceiling Protocol
d) I2C Communication Protocol.
e) OSTaskCreate( ),OSSemCreate( ),OSFlagPost( ),OSInit( )