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

N.B. : (1) Question No. **1** is **compulsory**.
(2) Answer any **four** out of remaining **six** questions.
(3) Assume **suitable** data wherever **required** but justify the **same**.
(4) **Figures** to the **right** indicate marks.

1. A 8051 based temperature controller controls (on/off) a air conditioner so that room temperature is within the range 22°C to 25 °C. Assume that signals "high" (to indicate temperature is >25 °C) and "low" (to indicate temperature is < 22°C) are available. The air conditioner requires a signal "control" to turn on and turn off. The system has a display which continuously displays "01" or "00" depending on whether air conditioner is on or off. Design the above system and write a program to control the air conditioner and display the message accordingly. **20**

2. (a) What is the maximum crystal frequency that can be used in a 8051 based system used for serial communication? Explain. **05**
(b) Draw and explain the timing diagram for external memory read operation of 8051. **15**
Show how you interface 16KB of program ROM and 16KB of data ROM to 8051 using minimum address decoding circuitry. Write instructions to output the sum of contents of first memory locations of both memories on P1.

3. (a) How timer/counter of 8051 is used as counter? What is the maximum frequency that can be counted in 8051? It is required to count arrival of 10 pulses from a device mounted at the entrance of a room and give a visual indication after 10 pulses are counted. Show how you can do this using timer/counter of 8051? **12**
(b) Explain the following instructions of 80196. **08**
i) BMOV ii) IDLPD iii) BR iv) EXTB

4. (a) Write a 80196 program to find the maximum of 10 eight bit numbers and output on port0. **10**
(b) What is a mailbox? How does a mailbox pass a message during interprocess communication? Differentiate between mailbox, queue and pipe. **10**

5. (a) What are Semaphores? Discuss the problems that may arise while using them. **10**
(b) Explain different methods used to save memory and power in embedded systems. **10**

6. (a) Write about different types of Embedded Systems Architectures and compare them. **12**
(b) Differentiate between the following. **08**
i. Princeton and Harward Architectures
ii. ALU and RALU
iii. I/O and HSI/O
iv. Timer/counter and Watch Dog Timer

7. Write short notes on the following. **20**
i. Preemptive and Non- Preemptive multitasking
ii. Interrupt structure of 8051
iii. PWM of 80196

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