

- N.B. (1) Question No. 1 is compulsory.  
(2) Answer any four of the remaining six questions.  
(3) Assume suitable data if required.

1. (a) Differentiate between a general purpose computing system and an embedded system. Comment on a mobile/hand held device as an embedded system. 10  
(b) Design a FSM (Finite State Machine) for a simple elevator control. The building has three floors (G + 2). Each floor has a call button and there are three buttons inside the elevator to choose the desired floor. Discuss the operation of the system through the FSM. 10
2. (a) Explain how an 8051 based system can be interfaced to a PC COM port. Give an algorithm for transmitting a byte and a text (message) from the microcontroller to the P.C. 10  
(b) List the differences in the operating systems of an embedded system and a desk top operating system. 10
3. In an embedded system, there are five tasks as shown in the table. Each of the tasks is a periodic and is ready to run at time 0. Each task will access CPU for 3 m. sec., after which the scheduler will allocate CPU to the next waiting task. Work with Rate Monotonic Scheduling and Deadline Monotonic Scheduling methods. Indicate the time slots in which the tasks are executed. Mention the waiting period for each task. State whether all tasks are meeting their deadlines. 20

Tasks	T1	T2	T3	T4	T5
Priority	2	1	4	3	5
Execution Time (ms)	12	16	8	11	15
Deadline (ms)	62	36	30	60	58

4. (a) Explain different strategies used by the scheduler and explain with an example, how the scheduling is done in RTOS. 10  
(b) Explain the use of petrinet model in Embedded System design. Describe the petrinet model of a timer. 10
5. (a) Write an assembly language program for the C code given below :— 10
- ```
int x, y, x ;  
while (1)  
{  
    while (! 90 - i);  
    if (x - i >= y - i) { x = x - i; y = y - i; }  
    else { x = y - i; y = x - i; }  
    while (y != 0)  
    {  
        x = x % y ;  
        x = y;  
        y = x;  
    }  
}
```
- (b) Give the features of I<sup>2</sup>C bus. How does the data transfer take place from master to slave device using I<sup>2</sup>C. 10

6. (a) What is bounded and unbounded priority inversion problem ? 10  
Explain with a suitable example. What is Priority Ceiling Protocol ?
- (b) Explain the architecture of ATMEL RISC Processor with a neat diagram. 10
7. Write short notes on any **four** of the following :— 20
- (a) Watchdog timer
  - (b) Inter process communication (IPC) in embedded systems
  - (c) RT Linux
  - (d) P and V semaphores
  - (e) Device drivers.
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