

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

(2) Answer any **four** questions out of the remaining **six** questions.

(3) Assume **suitable** data wherever **required**.

1. (a) Discuss design metric issues faced while designing an embeded system with the help of an example. **5**  
(b) Describe addressing modes of MSP 430 **OR** ARM7TDMI. **5**  
(c) Explain various basic serial communication methods. **5**  
(d) Compare software programming in assembly and C-programing lanauage. **5**
2. (a) Describe the operating modes and basic clock modules of MSP 430. **10**  
(b) Provide description of exceptions in ARM7TDMI (interrupts). **10**
3. (a) Explain thumb mode of ARM7TDMI core and compare it with normal mode. **10**  
(b) With the help of suitable (block) diagram explain :- **10**  
(i) Graphic LCD  
(ii) RS 232 /485  
(iii) PWM DC motor (speed control) interfacings.
4. (a) With the help of suitable examples, describe following C-program elements :- **10**  
(i) Header file  
(ii) Preprocessor directive  
(iii) Macro functions  
(iv) Modifier  
(v) Link-List.
- (b) For the given task calculate :- **10**  
(i) waiting time  
(ii) turnaround time for Shortest Job First (SJF) and Earliest Deadline First (EDF) scheduling. Commnet on the result. All tasks entered ready queue at same time.

Task ID	Execution Time	Deadline
T <sub>1</sub>	06	39
T <sub>2</sub>	16	30
T <sub>3</sub>	18	45

5. (a) Give need for inter-process communication and synchronization. Describe the methods of the same (IPC) in detail. **10**
- (b) What is realtime system ? Compare RTOS with traditional OS. Discuss Interrupts with respect to realtime behaviour. **10**
6. (a) Design a car control embeded system with following specifications/features :- **20**
- (i) It is an electric car
  - (ii) Steering angle, acceleration, direction (R/F) are inputs from driver
  - (iii) It control speed, Left/Right steering, Forward/Backward direction
  - (iv) Displays speed.

For designing above system give/show –

- (1) Show block diagram for hardware
- (2) Software modules/drivers diagram, flowchart
- (3) FSM/Petrinet model of the system
- (4) Real time challenges and solutions
- (5) Suggest hardware and software solutions/tools used
- (6) Suggest testing, debugging, realtime issues.

7. Attempt any **three** :- **20**
- (a) Discuss and compare various embeded micro controller core like RISC, CISC, SOC, ARM.
  - (b) Give features of CAN and explain protocol
  - (c) Describe embeded programming tools like compiler, cross compiler, integrated development environment, in circuit emulator.
  - (d) Explain priority inversion problems and solutions.

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