

(Time: 2½ hours)

Total Marks: 75

- N. B.: (1) **All** questions are **compulsory**.  
 (2) Make **suitable assumptions** wherever necessary and **state the assumptions** made.  
 (3) Answers to the **same question** must be **written together**.  
 (4) Numbers to the **right** indicate **marks**.  
 (5) Draw **neat labeled diagrams** wherever **necessary**.  
 (6) Use of **Non-programmable** calculators is **allowed**.

**1. Attempt any three of the following: 15**

- Explain the difference between general purpose computer system and embedded system. What are different application areas of embedded systems?
- Enlist various purposes of embedded systems. Explain any two in detail.
- What is difference between
  - RISC and CISC processors.
  - Little endian and big endian processors.
- Explain sensor and actuator. Explain any one sensor device used in embedded system in detail.
- Explain I2C bus in detail.
- Explain operational quality attributes of embedded system

**2. Attempt any three of the following: 15**

- What is embedded firmware? Explain watchdog timer in detail.
- Explain the following
  - EPROM and EEPROM.
  - Static RAM and dynamic RAM.
- Explain importance of memory testing. What are different memory testing methods? Explain any one memory testing method in detail.
- Write short note on washing machine-application specific embedded system.
- Explain memory map and interrupt map of 8051 microcontroller.
- What is device driver? Explain role of device driver in embedded operating system based products.

**3. Attempt any three of the following: 15**

- What are the features of 8051 microcontroller? Draw block diagram of 8051 and explain.
- Explain I/O ports in microcontroller 8051. Write 8051 C program to toggle all bits of P0 continuously.
- Explain data types in 8051. Write an 8051 C program to send values of -4 to +4 to port P1.

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- d. Explain the following registers
  - 1. Program status word.
  - 2. Data pointer and program counter.
- e. Explain following
  - 1. ROM.
  - 2. NV RAM.
  - 3. Flash memory.
- f. Write 8051 C program to convert ASCII digits '4' and '7' to packed BCD and display them on port P1.

**4. Attempt any three of the following: 15**

- a. What are different factors to be considered in selecting a microcontroller for any application?
- b. Define the following
  - 1. Machine language.
  - 2. Hex file.
  - 3. Linker.
  - 4. Assembler.
  - 5. Simulator.
- c. What is pointer in embedded C? Explain its role in embedded C programs.
- d. What is function of delay programming in embedded applications? Explain how infinite loop can be used to introduce delay. Give suitable embedded C program for the same.
- e. What is debugging? What are different debugging techniques?
- f. Explain register banks in 8051 microcontroller. Which is default register bank? How register bank can be selected using Program Status Word register (PSW)?

**5. Attempt any three of the following: 15**

- a. What are basic functions of real time kernel?
- b. What are functional requirements in selection of real-time operating system (RTOS)?
- c. What is the importance of disassembler and emulator?
- d. What is Embedded Product Development Life Cycle? Explain the following phases
  - 1. Need.
  - 2. Conceptualization.
  - 3. Development and testing.
- e. What are different files generated in cross compiler?
- f. Write short note on trends in embedded industry with the following points
  - 1. Processor.
  - 2. Development languages.

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