(Time: $2\frac{1}{2}$ hours)

[Total Marks: 60

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 two* of the following:**   **12**
a.   Explain internal and external communication interface.
b.   Explain characteristics of embedded system with example.
c.   Discuss the phases of SDLC.
d.   Explain Non-operational quality attributes of embedded systems.

2.   **Attempt *any two* of the following:**   **12**
a.   Explain the fundamental issues in hardware and software co-design.
b.   Explain embedded firmware design approaches.
c.   Explain different functions of RTOS.
d.   Explain High level language to machine language conversion process.

3.   **Attempt *any two* of the following:**   **12**
a.   What is Memory Map? Why is memory map necessary in the design of embedded systems?
b.   Explain internal architecture of typical memory chip.
c.   Explain Refresh Timing and Refresh address in reference of DRAM memory Interface.
d.   What do understand by memory testing? Explain RAM and ROM memory testing methods.

4.   **Attempt *any two* of the following:**   **12**
a.   What type of files can be included using Include Preprocessor directive?
b.   What are main features of source code engineering tools for embedded C/C++?
c.   Explain the use of queue in network protocol implementation.
d.   Explain the uses of a list of tasks in a ready list.

5.   **Attempt *any two* of the following:**   **12**
a.   Write a note on embedded OS trends.
b.   Explain the function of each bit of Status register of PIC microcontroller.
c.   Explain the I/O mapped registers associated with each port of AVR controller.
d.   Draw the architecture of ARM microcontroller.

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