

2025

COMPUTER SCIENCE — HONOURS

Paper : DSE-A-3

(Embedded Systems)

Full Marks : 50

The figures in the margin indicate full marks.

*Candidates are required to give their answers in their own words
as far as practicable.*

Answer **question no. 1** and **any four** questions from the rest.

1. Answer **any five** questions : 2×5
- (a) Highlight the major characteristics of Port-0 of microcontroller 8051.
 - (b) What is the purpose of program lock bits in relation to the 8051 microcontrollers?
 - (c) How can we select the different register banks of data memory in microcontroller 8051 using PSW?
 - (d) Explain the purpose of stack pointer register in relation to the 8051 microcontrollers.
 - (e) What will be the content of the accumulator after executing MOV A, @R2 and MOV A, R2 instructions? Assuming R2 = 4AH and internal RAM at 4AH holds 15H.
 - (f) Explain the instruction CJNE @R_i, #Data with appropriate illustrations, where R_i is registers R₀ and R₁ and #Data is data immediately provided with the instruction.
 - (g) What is an Entity in VHDL? Explain with suitable examples.
 - (h) What are identifiers with respect to VHDL? What are the rules for naming identifiers in VHDL?
2. (a) Illustrate the internal schematic diagram of **Port-0 in microcontroller 8051** and describe its functionality in details.
- (b) Describe the SETB C instruction with an appropriate diagram. 7+3
3. (a) What is an interrupt? Explain the TCON Special Function Register (SFR) used for handling external interrupts in the 8051 microcontrollers.
- (b) Compare and contrast between Microcontroller and Microprocessor. 7+3
4. (a) Explain the purpose of subroutines and the role of the stack pointer in a subroutine call operation with appropriate diagram.
- (b) Explain the functionality of the PUSH A instruction in the 8051 microcontrollers, along with a relevant diagram. 8+2

Please Turn Over

(2033)

5. (a) Implement the following using a PLD circuit, where O_1 , O_2 , O_3 are the outputs :

$$O_1 = A \cdot B + A \cdot \bar{B}$$

$$O_2 = 1$$

$$O_3 = \bar{A} \cdot B + \bar{A} \cdot \bar{B}$$

Explain it with suitable circuit diagram.

- (b) What is the purpose of program store Enable ($\overline{\text{PSEN}}$) and External Access $\overline{\text{EA}}$?
- (c) Draw the schematic circuit diagram of microcontroller used as a standalone unit. 4+3+3
6. (a) Explain the MOVX A, @DPTR instruction with a suitable diagram.
- (b) What is Power-On Reset and why is it crucial in a microcomputer system? 6+4
7. (a) What is the purpose of port-registers? Explain in relation to microcontroller 8051.
- (b) List and explain four types of bit-oriented logical operation instructions in the 8051 microcontroller, including examples and suitable diagrams. 3+7
8. (a) Explain the unconditional instruction LJMP, AJMP and SJMP in relation to the microcontroller 8051 with appropriate diagram.
- (b) Write a short note on data memory organization in relation to microcontroller 8051. 6+4
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