

Digital Techniques and Microprocessors (313305)

MSBTE Diploma · K-Scheme · Model Question Paper — Set A

Time: 3 Hours**Max. Marks: 70****Instructions:**

1. All questions are compulsory.
2. Answer each next main question on a new page.
3. Illustrate your answers with neat sketches wherever necessary.
4. Figures to the right indicate full marks.
5. Assume suitable data, if necessary.
6. Use of non-programmable electronic pocket calculator is permissible.
7. Mobile phone, pager and any other electronic communication devices are not permissible in the examination hall.

Q.1 Attempt any FIVE of the following:**10**

- a) Define: i) Bit ii) Nibble iii) Byte iv) Word.
- b) Draw the symbol and write the truth table of EX-OR gate and NOR gate.
- c) State any four features of 8086 microprocessor.
- d) State the function of ALE and $\overline{DT/R}$ pins of 8086.
- e) State the use of the following assembler directives with example: i) DB ii) ASSUME.
- f) Write any two arithmetic instructions of 8086 with example.
- g) Define minterm and maxterm with one example each.

Q.2 Attempt any THREE of the following:**12**

- a) Convert the following:
i) $(237)_{10} = (?)_2 = (?)_{16}$ ii) $(3AC)_{16} = (?)_8$
- b) State and prove De Morgan's theorems using truth tables.
- c) Describe memory segmentation in 8086 with a neat diagram. State any two advantages of segmentation.
- d) Write an assembly language program to add two 16-bit numbers. Store the sum and the carry in memory.

Q.3 Attempt any THREE of the following:**12**

- a) Perform the following subtractions using 2's complement method (8-bit):
i) $(46)_{10} - (29)_{10}$ ii) $(25)_{10} - (58)_{10}$
- b) Minimize the following expression using K-map and draw the logic diagram using basic gates:
 $Y(A, B, C, D) = \sum m(0, 2, 5, 7, 8, 10, 13, 15)$

- c) Explain any four addressing modes of 8086 with suitable examples.
- d) Describe the following string instructions with example: i) MOVSB ii) CMPSB iii) SCASB iv) LODSB.

Q.4 Attempt any THREE of the following:

12

- a) Realize NOT, AND, OR and NOR gates using NAND gates only.
- b) Design a half adder. Write its truth table, simplify the outputs using K-map and draw the logic diagram.
- c) Draw and explain the flag register of 8086.
- d) Calculate the physical address for the following:
 - i) CS = 3420H, IP = 1A5CH ii) DS = 7B00H, BX = 0F36H
 - iii) SS = 5000H, SP = FFF0H iv) ES = 2A3FH, DI = 4C21H
- e) Write an assembly language program to find the largest number from an array of 10 bytes.

Q.5 Attempt any TWO of the following:

12

- a) i) Draw the logic diagram of 4 : 1 multiplexer and write its truth table.
ii) Design a 16 : 1 multiplexer using 4 : 1 multiplexers.
- b) Draw the architecture of 8086 microprocessor and explain the functions of Bus Interface Unit and Execution Unit.
- c) Write an assembly language program to arrange 10 bytes in ascending order. Draw the flowchart for the same.

Q.6 Attempt any TWO of the following:

12

- a) Draw the logic diagram of clocked J-K flip-flop using NAND gates and write its truth table. Explain the race-around condition and how it is avoided.
- b) Assume AX = 5A3CH and BX = 0F0FH before each instruction. Write the result in the destination and the status of CF and ZF after:
 - i) AND AX, BX ii) OR AX, BX iii) XOR AX, BX
 - iv) NOT AX v) MOV CL, 04H followed by ROL AX, CL vi) SHR BX, 1
- c) Write an assembly language program to add 10 BCD numbers stored in an array. Store the BCD result at the end of the array.

Note: This is a **model question paper prepared by Ananda Technologies** only for practice and exam preparation, based on the pattern of previous MSBTE question papers and the K-scheme syllabus. It is **not an official MSBTE paper**, and it does **not** mean that these questions will come in the exam. Answers follow standard textbook points; marks shown are indicative. Free for students — anandatechnologies.in