**Assignment No.10**

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| **Title of Assignment:**  Write 80387 ALP to find the roots of the quadratic equation. All the possible cases must be considered in calculating the roots. |
| **Relevant Theory:**  **Explanation:**  **a) Features of 80387:**  • High performance 80-Bit Internal Architecture  • Implements ANSI/IEEE standard 754-1985 for Binary floating-point arithmetic  • Expands Intel386DX CPU data types to include 32-, 64-, 80-bit floating point, 32-, 64-bit  integers and 18-bit BCD operands  • Extends Intel386DX CPU instruction set to include Trigonometric, Logarithmic,  Exponential and Arithmetic instructions for all data types  • Upward object code compatible  • Full-range transcendental operations for SINE, COSINE, TANGENT, ARCTANGENT  and LOGARITHM  • Built-in Exception handling  • Operates independently in all modes of 80386  • Eight 80-bit Numeric registers  • Available in 68-pin PGA package  • One version supports 16MHz-33MHz  **80387 Functional block diagram:**    Figure . Intel387TM DX Math CoProcessor Block Diagram  **Register Set**   * Data registers: Eight 80-bit registers, * Tag Word: the tag word marks the content of each numeric data register, two bits for each data register * Status word: the 16-bit status word reflects the overall state of the MCP * Instruction and Data pointers: two pointer registers allows identification of the   failing numeric instruction which supply the address of failing numeric instruction  and the address of its numeric memory operand.   * Control Word: several processing options are selected by loading a control word   from memory into the control register  c) Instruction of co-processor used in the assignment:  FINIT: Initialise Co-processor  FLDZ: Load zero on stack top  FILD: Load Integer on stack  FIDIV: Divide stack top by an integer value  FIMUL: Multiply stack top by an integer value  FST: Store stack top  FADD: Add in stack top  FBSTP: Store integer part of stack top in 10 byte packed BCD format  FMUL: Multiply stack top  FSQRT: Square Root of Stack Top  FSTSW: Stores the coprocessor status word  FTS: compares ST0 and 0  **d) Concept of Quadratic Equation:**  The quadratic formula computes the solutions to the quadratic equation:  ax2 + bx + c = 0  The formula itself gives two solutions for x: x1 and x2.  \_1, \_2 = \_\_± \_\_\_\_  \_\_  The expression inside the square root (b2 − 4ac) is called the discriminant.  Its value is useful in determining which of the following three possibilities are true for the  solutions.  1. There is only one real degenerate solution. b2 − 4ac = 0  2. There are two real solutions. b2 − 4ac > 0  3. There are two complex solutions. b2 − 4ac < 0  **Design Analysis/ Implementation Logic:**  **Algorithm**  i. Start  ii.input a,b,c and initialize four,two in data section  iii. Initialize the co-processor  i. Load b on stack top  ii. multiply top of stack with b  iii. Load a on stack  iv. Multiply stack top with c  v. Multiply stack top with four  vi. Subtract operand 1 from operand2 of stack  vii. Test stack top  viii. Store co-processor status word in AX  ix. Store AH value in Flag register  x. If top of stack is less than zero then jump to step xxi else continue  xi. Take square root of top of stack  xii. Store it in one variable let D (D=sqrt(b\*b-4ac))  xiii. Subtract b from stacktop  xiv. Divide stack top by a and two  xv. Call Disp\_result procedure to display root1  xvi. Load zero on stack top  xvii. Subtract D from Stacktop (i.e 0-D=-D)  xviii. Subtract b from stacktop  xix. Divide stack top by a and two  xx. Call Disp\_result procedure to display root2  xxi. Display Message “No Real Solution” using Display macro  xxii. Stop |
| **Testing:**  **Test Conditions:**  **Input:**  **Input a,b,c**  **Output:**  Roots of quadratic equation |
| **FAQs:**   1. Explain 80387 instruction 2. How 80387 is initialized.   . |
| **Conclusion:** Successfully implemented 80387 ALP to find the roots of the quadratic equation. All the possible cases must be considered in calculating the roots.  . |