

**Department of Computer Science & Engineering**

**Microprocessor & Computer Architecture**

**MPCA-Laboratory/Assignment/Hands-on/Project**

**UE20CS252**

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**BRANCH: BTECH/CSE/SEM-IV**

**SECTION: C**

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| **Sl. No** | **Programs** |
| **Week No.5** | 1. Write a program in ARM7TDMI-ISA to generate Fibonacci Series and store  them in an array.  2. Write a program in ARM7TDMI-ISA to find smallest number in an array of n  32 bit numbers. Display the element if found.  3. Write a program in ARM7TDMI-ISA to add 2 matrices of order3.  i.e., Implement c[i][j]= a[i][j] + b[i][j].  4. Write a program in ARM7TDMI-ISA to transfer a block of 256 words stored  at memory location X to memory location Y using Load Multiple and Store  Multiple instructions. The rate of transfer is 32 bytes.  **Student exercises:**  1. Write a program in ARM7TDMI-ISA to multiply 2 matrices of order3.  i.e., implement c[i][j]=c[i][j] + a[i][j] x b[i][j].  a. Use MLA instruction  **PROGRAM:**  .DATA  A:.WORD 10, 20, 30 ,40, 50, 60, 70, 80, 90  B:.WORD 1, 2, 3, 4, 5, 6, 7, 8, 9  C:.WORD 1, 1, 1, 1, 1, 1, 1, 1, 1  .TEXT  LDR R1,=A  LDR R2,=B  LDR R7,=C    LDR R8,[R1]  LDR R9,[R2]  LDR R3,[R7]    MOV R5,#0    SECOND:  MOV R6,#0  FIRST:  MLA R3,R8,R9,R3  STR R3,[R7]  ADD R6,R6,#1  LDR R9,[R2,#4]!  LDR R3,[R7,#4]!  CMP R6,#3  BNE FIRST    ADD R5,R5,#1  LDR R8,[R1,#4]!  CMP R5,#3  BNE SECOND  SWI 0X011    b. Use MUL instruction  **PROGRAM:**  .DATA  A:.WORD 10, 20, 30 ,40, 50, 60, 70, 80, 90  B:.WORD 1, 2, 3, 4, 5, 6, 7, 8, 9  C:.WORD 1, 1, 1, 1, 1, 1, 1, 1, 1  .TEXT  LDR R1,=A  LDR R2,=B  LDR R7,=C    LDR R8,[R1]  LDR R9,[R2]  LDR R3,[R7]    MOV R5,#0    SECOND:  MOV R6,#0  FIRST:  MUL R4,R8,R9  ADD R3,R3,R4  STR R3,[R7]      ADD R6,R6,#1  LDR R9,[R2,#4]!  LDR R3,[R7,#4]!  CMP R6,#3  BNE FIRST    ADD R5,R5,#1  LDR R8,[R1,#4]!  CMP R5,#3  BNE SECOND  SWI 0X011      **NOTE: This is not the actual matrix multiplication but only the implementation of C[i][j] = C[i][j] + A[i][j] \* B[i][j].**  2. Write a program in ARM7TDMI-ISA to find the NORM of a square matrix of  order n.  **PROGRAM:**  .DATA  MATRIX:.WORD -1, 2, 3, 4, 5, 6, 7, 8, 9  ORDER:.WORD 3  NORM\_ARRAY:.WORD 0, 0, 0  NORM:.WORD 0  .TEXT  LDR R0,=MATRIX  LDR R1,=ORDER  LDR R2,=NORM\_ARRAY    LDR R3,[R0]  LDR R4,[R1]    MOV R5,R4  MUL R8,R5,R5    MOV R5,#0    FIRST:  MOV R6,R5  MOV R7,#0  MOV R9,#4  MUL R9,R6,R9  LDR R3,[R0,R9]  SECOND:  ; Abs() value of R3  ASR R10,R3,#31  ADD R3,R10,R3  EOR R3,R3,R10    ADD R7,R7,R3  ADD R6,R6,R4    MOV R9,#4  MUL R9,R6,R9  LDR R3,[R0,R9]  CMP R6,R8  BLT SECOND    ADD R5,R5,#1  STR R7,[R2],#4  CMP R5,R4  BLT FIRST  FIND\_MAX:  LDR R0,=NORM\_ARRAY  LDR R4,=ORDER  LDR R4,[R4]  MOV R3,#1  LDR R2,[R0]    LOOP:  LDR R1,[R0],#4  CMP R1,R2  MOVGE R2,R1    ADD R3,R3,#1  CMP R3,R4  BLE LOOP  LDR R5,=NORM  STR R2,[R5]  SWI 0X011    The first 3 values of 000010DC shows the absolute column sum for that column of the given matrix. The 4th value, that is, 000010E8 shows the NORM value for that matrix – 12 in hex = 18 in decimal  The given matrix is –  | -1 2 3 |  | 4 5 6 |  | 7 8 9 |  Order = 3  |-1| + |4| + |7| = 12 = C in hex  |2| + |5| + |8| = 15 = F in hex  |3| + |6| + |9| = 18 = 12 in hex      3. Write a program in ARM7TDMI-ISA to find the ROWSUM of a matrix.  **PROGRAM:**  .DATA  MATRIX:.WORD 1, 2, 3, 4, 5, 6, 7, 8, 9  ROWS:.WORD 3  COLUMNS:.WORD 3  ROWSUM:.WORD 0, 0, 0  .TEXT  LDR R0,=MATRIX  LDR R1,=ROWS  LDR R2,=COLUMNS  LDR R9,=ROWSUM    LDR R3,[R0]  LDR R4,[R1]  LDR R5,[R2]    MOV R6,#1  FIRST:  MOV R7,#1  MOV R8,#0  SECOND:  ADD R8,R8,R3    LDR R3,[R0,#4]!  ADD R7,R7,#1  CMP R7,R5  BLE SECOND    STR R8,[R9],#4  ADD R6,R6,#1  CMP R6,R4  BLE FIRST  SWI 0X011    The matrix taken is  | 1 2 3 |  | 4 5 6 |  | 7 8 9 |  ROWSUM = 6, 15, 24 – DEC  6, F , 18 – HEX |
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