PES UNIVERSITY

**Department of Computer Science & Engineering**
**Microprocessor & Computer Architecture Lab**
**SRN:PES2UG22CS546**
**Lab 3 Submission Format**

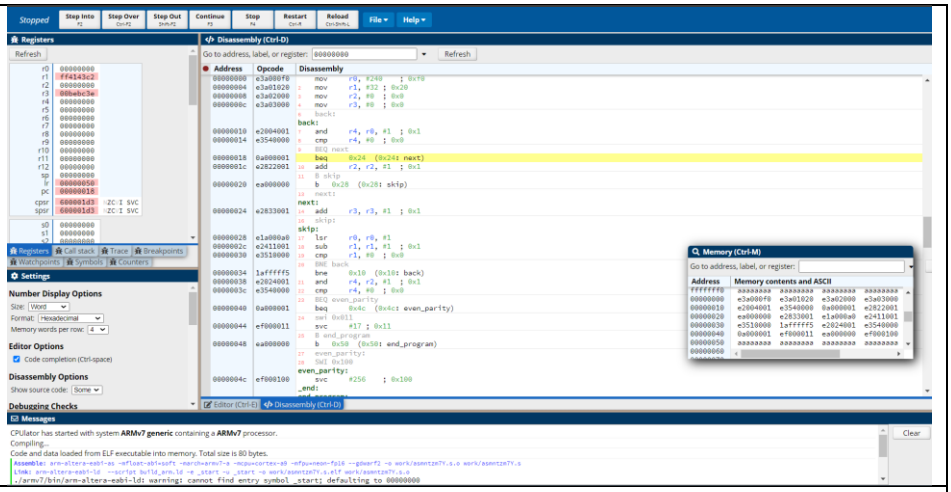
**UE22CS251B**

1 Write an ALP to check whether the given number has odd or even number of 1's (Even Parity and Odd Parity).

Program:

```
1   MOV R0, #0x00F0
2   MOV R1, #32
3   MOV R2, #0
4   MOV R3, #0
5
6   back:
7   AND R4,R0,#1
8   CMP R4,#0
9   BEQ next
10  ADD R2, R2, #1
11  B skip
12
13  next:
14  ADD R3, R3, #1
15
16  skip:
17  LSR R0,R0,#1
18  SUB R1, R1, #1
19  CMP R1, #0
20  BNE back
21  AND R4,R2,#1
22  CMP R4,#0
23  BEQ even_parity
24  swi 0x011
25  B end_program
26
27  even_parity:
28  SWI 0x100
29
30  end_program:
31
```

Output Screen Shot:



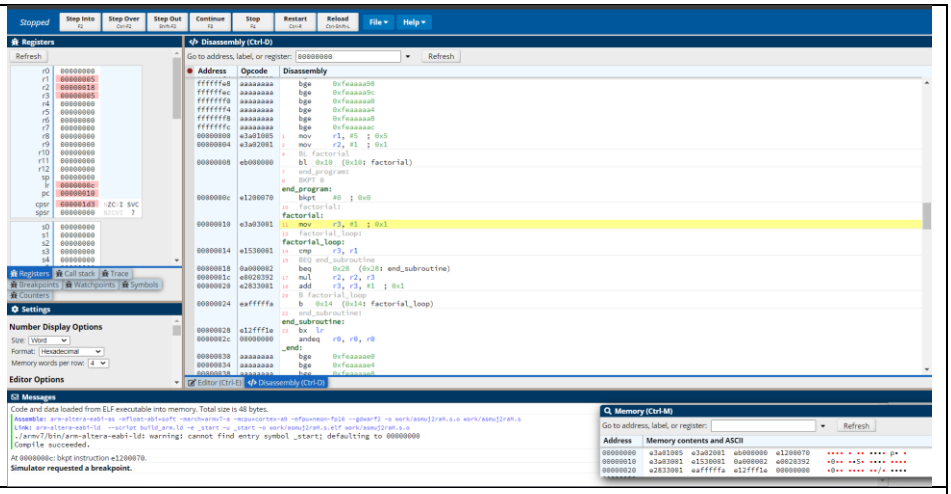
2 Write a program to compute the factorial of a number using subroutines.

Program:

W3_P2.S

```
1       MOV R1, #5
2       MOV R2, #1
3
4       BL factorial
5
6
7   end_program:
8       BKPT 0
9
10  factorial:
11      MOV R3, #1
12
13  factorial_loop:
14      CMP R3, R1
15      BEQ end_subroutine
16
17      MUL R2, R2, R3
18      ADD R3, R3, #1
19
20      B factorial_loop
21
22  end_subroutine:
23      BX LR
24
```

Output Screen Shot:



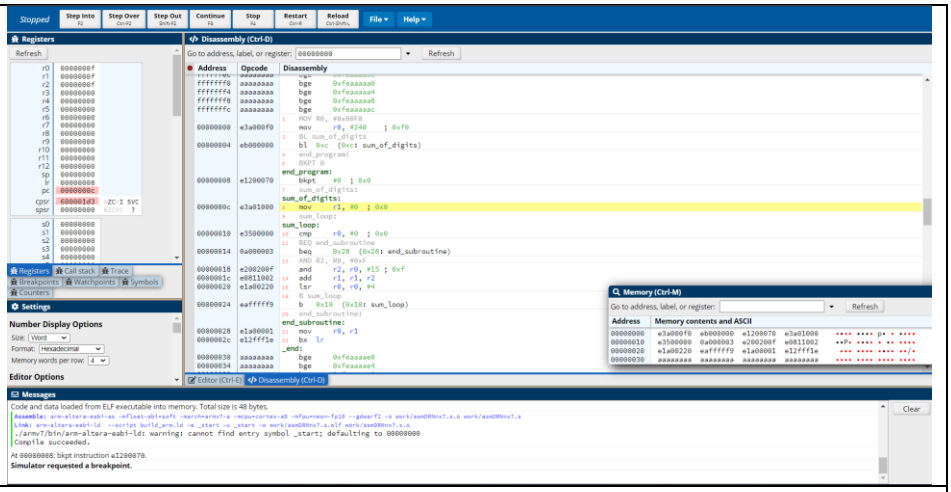
3 Write an ALP to find the sum of all the digits of a given 32 bit number.

Program:

W3_P3.s

```
1    MOV R0, #0x00F0
2    BL sum_of_digits
3
4    end_program:
5        BKPT 0
6
7    sum_of_digits:
8        MOV R1, #0
9    sum_loop:
10       CMP R0, #0
11       BEQ end_subroutine
12
13       AND R2, R0, #0xF
14       ADD R1, R1, R2
15
16       LSR R0, R0, #4
17
18       B sum_loop
19
20   end_subroutine:
21       MOV R0, R1
22       BX LR
23
```

Output Screen Shot:



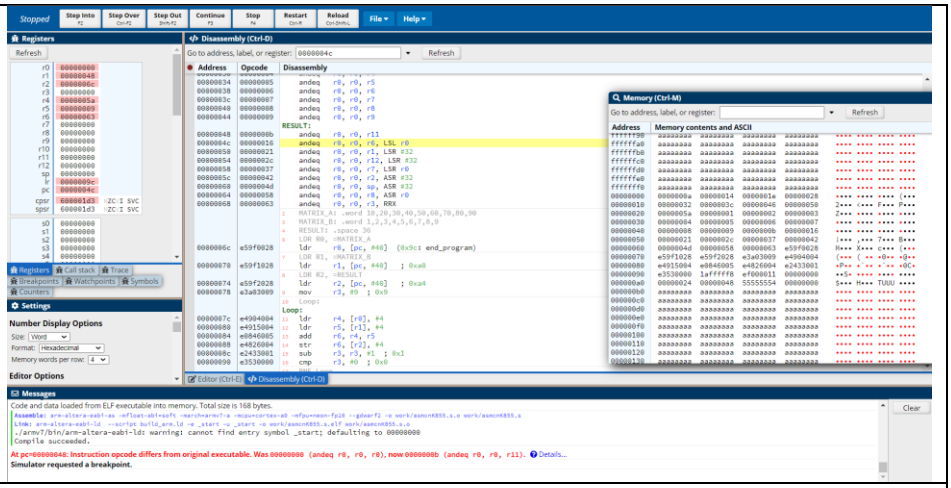
4 Write a program to perform 2X2 matrix addition. (you may Try for 3 X 3).

Program:

W3_P4.s

```
1
2    MATRIX_A: .word 10,20,30,40,50,60,70,80,90
3    MATRIX_B: .word 1,2,3,4,5,6,7,8,9
4    RESULT: .space 36
5
6    LDR R0, =MATRIX_A
7    LDR R1, =MATRIX_B
8    LDR R2, =RESULT
9    MOV R3, #9
10   Loop:
11   LDR R4, [R0], #4
12   LDR R5, [R1], #4
13   ADD R6, R4, R5
14   STR R6, [R2], #4
15   SUB R3, R3, #1
16   CMP R3, #0
17   BNE Loop
18   SWI 0x011
19   end_program:
```

Output Screen Shot:

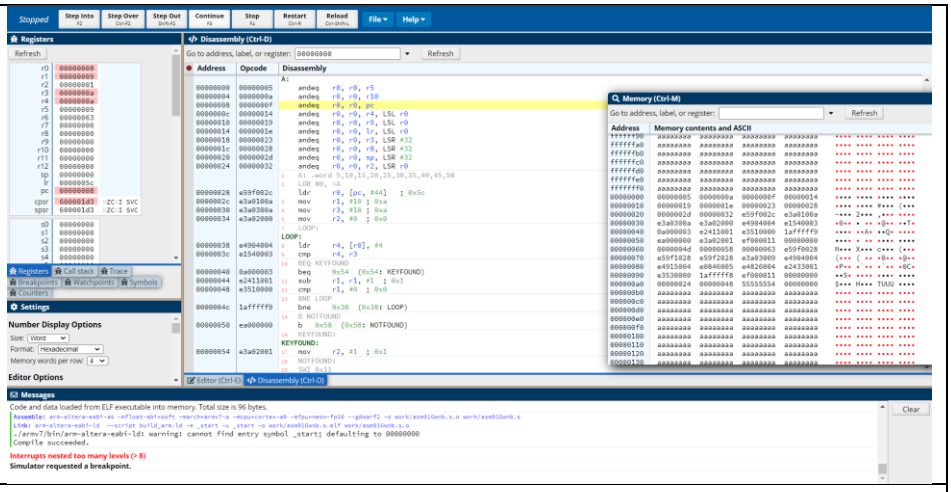


5 Write a program to search for an element in an array using Linear search technique

Program:

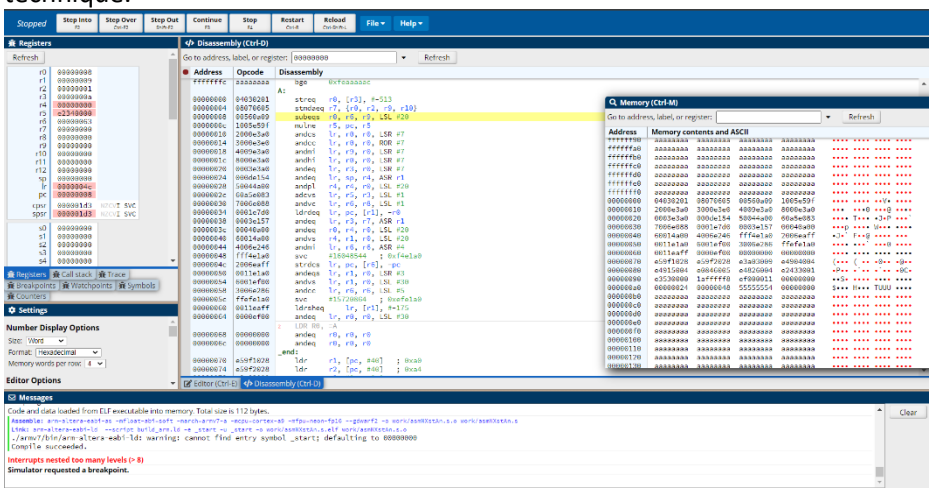
```
W3_P5.s
1    A: .word 5,10,15,20,25,30,35,40,45,50
2    LDR R0, =A
3    MOV R1, #10
4    MOV R3, #10
5    MOV R2, #0
6
7    LOOP:
8        LDR R4, [R0], #4
9        CMP R4, R3
10       BEQ KEYFOUND
11       SUB R1, R1, #1
12       CMP R1, #0
13       BNE LOOP
14       B NOTFOUND
15
16   KEYFOUND:
17       MOV R2, #1
18
19   NOTFOUND:
20       SWI 0x11
21       .end
22
```

Output Screen Shot:



6 Assignment Questions:

i) Write a program to search for an element in an array using binary search technique.



Program:

W3_P6.s

```
A: .BYTE 1,2,3,4,5,6,7,8,9,10
LDR R0, =A
MOV R1, #5
MOV R2, #-1
MOV R3, #0
MOV R4, #9
MOV R8, #0
L:
CMP R4, R3
BMI EXIT
ADD R5, R3, R4
ADD R6, R8, R5, LSR #1
LDRB R7, [R0,R6]
CMP R7, R1
BEQ FOUND
BMI LESSER
SUB R6, R6, #1
MOV R4, R6
B L
FOUND:
MOV R2, R6
SWI 0x011
LESSER:
ADD R6, R6,#1
MOV R3, R6
B L
EXIT:
SWI 0x011
```

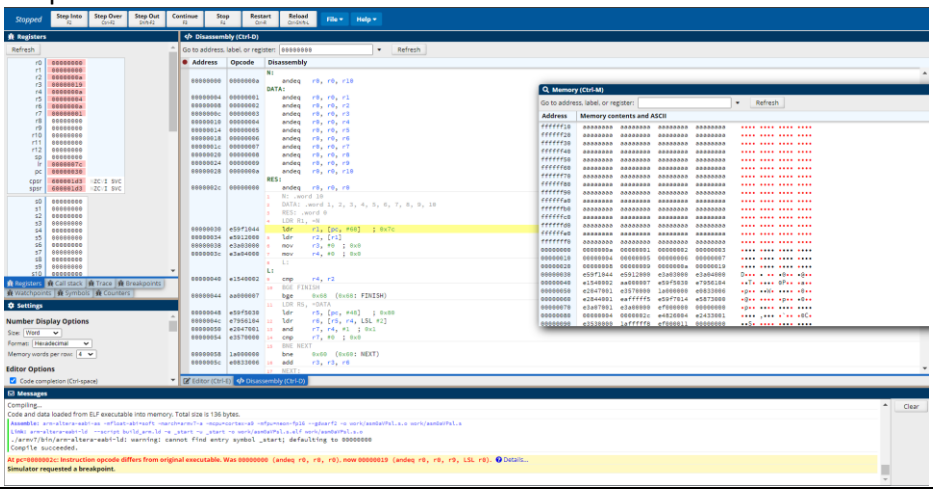
ii)Write a program to find the sum of N data items at alternate [odd or even positions] locations in the memory. Store the result in the memory location.

Program:

W3_P6_1.s

```
1   N: .word 10
2   DATA: .word 1, 2, 3, 4, 5, 6, 7, 8, 9, 10
3   RES: .word 0
4    LDR R1, =N
5    LDR R2, [R1]
6    MOV R3, #0
7    MOV R4, #0
8   L:
9    CMP R4, R2
10   BGE FINISH
11   LDR R5, =DATA
12   LDR R6, [R5, R4, LSL #2]
13   AND R7, R4, #1
14   CMP R7, #0
15   BNE NEXT
16   ADD R3, R3, R6
17  NEXT:
18   ADD R4, R4, #1
19   B L
20  FINISH:
21   LDR R7, =RES
22   STR R3, [R7]
23   MOV R7, #1
24   MOV R0, #0
25   SWI 0
```

Output Screen Shot:



**Note:**

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  - Will be provided by the respective Theory Teacher
- Upload PDF only.

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