Faculty of Engineering

Ain Shams University

CSE 211s:Introduction to Embedded Systems

REPORT (2)

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Sec.: 1

Program: CSE

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Question 3:

Q3. Write ARM assembly code to sum the array items of size 10 and store it in the memory. The array contains the following values:1, 2, 3, 4, 5, 6, 7,8, 9, 10.

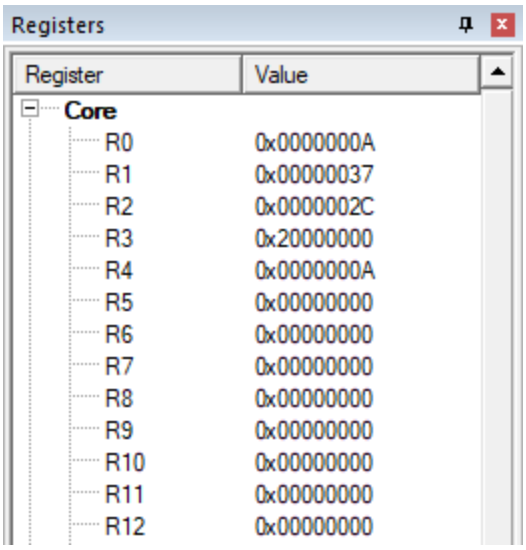
Assembly Code:

```
                AREA RESET, DATA, READONLY
                EXPORT __Vectors
__Vectors
                DCD 0x20008000
                DCD Reset_Handler
                ALIGN
                AREA myCode, CODE, ReadOnly
                ENTRY
                EXPORT Reset_Handler

Reset_Handler
ARR_SIZE        EQU         10
                MOV R0, #0 ; initialize array index -i- to 0
                MOV R1, #0 ; initialize sum to 0
                LDR R2, =Arr ; load the base address of the array in R2
                LDR R3, =0x20000000 ; storing the address sum will be stored in it in R3
LOOP            CMP R0, #ARR_SIZE ; check loop condition i < array size
                BEQ STORING
                LDR R4, [R2, R0, LSL #2] ; load data of Arr[i]
                ADD R1, R1, R4 ; sum = sum + Arr[i]
                ADD R0, R0, #1; increment of i
                B       LOOP
```

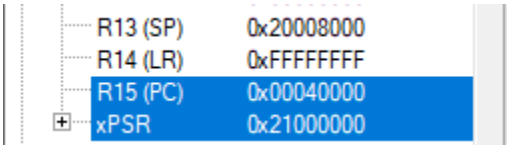
```
STORING     STR    R1, [R3] ; storing sum in the memory address stored in R3

                   ALIGN
                   AREA myData, DATA, READONLY

Arr                DCD 1,2,3,4,5,6,7,8,9,10
                   END
```

Registers:

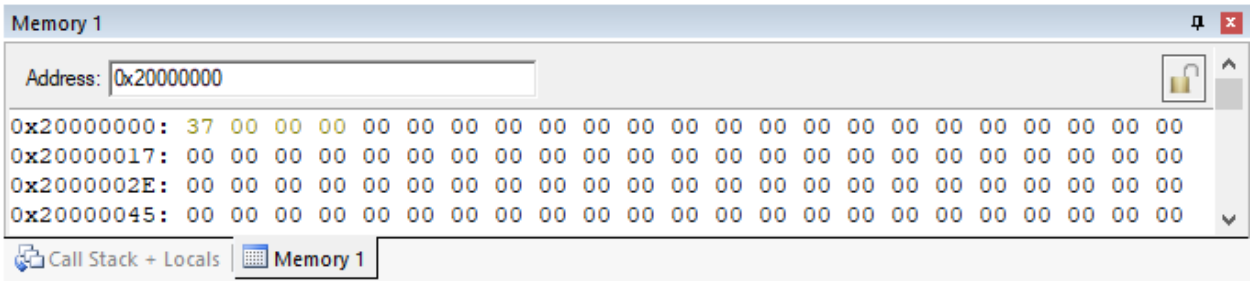
General Registers



Special Registers



Memory:



Question 4:

Assembly Code:

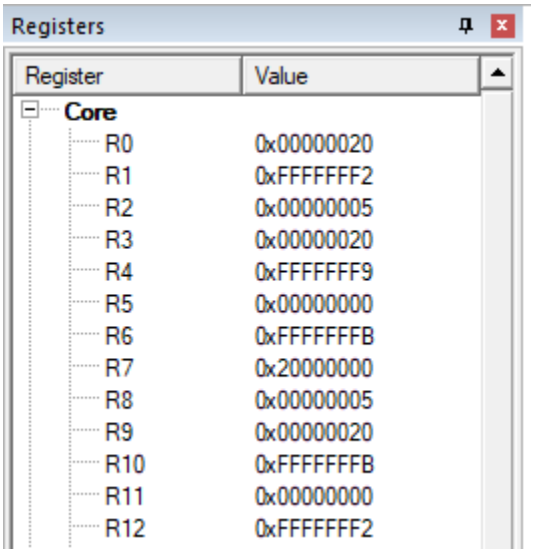
```
                AREA RESET, DATA, READONLY
                EXPORT __Vectors
__Vectors
                DCD 0x20008000
                DCD Reset_Handler
                ALIGN

                AREA myCode, CODE, ReadOnly
                ENTRY
                EXPORT Reset_Handler

Reset_Handler
                MOV R0, #6      ; R0 elem count
                MOV R1, #-14
                MOV R2, #5
                MOV R3, #32
                MOV R4, #-7
                MOV R5, #0
                MOV R6, #-5
                PUSH {R4}
                PUSH {R5}
                PUSH {R6}
                BL   MAXMIN
                B    FINISH
MAXMIN          POP     {R6}
                POP     {R5}
                POP     {R4}
                PUSH    {LR}
```

```
                LDR R7 , =ARR
                STR R1 , [R7]
                STR R2 , [R7 ,#4]
                STR R3 , [R7 ,#8]
                STR R4 , [R7 ,#12]
                STR R5 , [R7 ,#16]
                STR R6 , [R7 ,#20]
                MOV R8 , #0     ;INDEX COUNT
                LDR R9  , [R7]          ;TEMP REG. WITH FIRST VALUE IN TEMP ARR.  MAX TEMP
                LDR R12 , [R7]          ;TEMP REG. WITH FIRST VALUE IN TEMP ARR   MIN TEMP
LOOP            SUBS R0 , #1
                BEQ   RETURN
                ADD R8 ,R8 ,#1
                LDR R10 ,[R7 , R8 , LSL #2]
                CMP R10 , R9            ;R10 – R9
                BGT   GT
                CMP R10 , R12           ;R10 – R12
                BLT   LT
DONE            B    LOOP
RETURN          POP     {LR}
                MOV R0 , R9     ;MAX
                MOV R1 , R12    ;MIN
                BX   LR
GT              MOV R9 , R10   ; UPDATE THE VALUE TO THE BIGGER ONE , R9 CONTAIN MAX
                B    DONE
LT              MOV R12 , R10 ; UPDATE THE VALUE TO THE BIGGER ONE , R11 CONTAIN MIN
                B    DONE
FINISH          STR R0 , [R7 ,#24]
                STR R1 , [R7 ,#28]
```

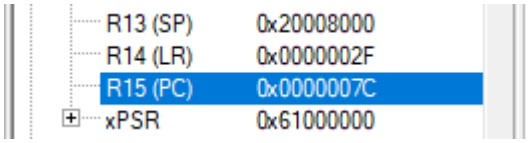
```
                ALIGN
                AREA myVarArr ,DATA ,READWRITE

ARR             SPACE   24
                END
```

Registers:

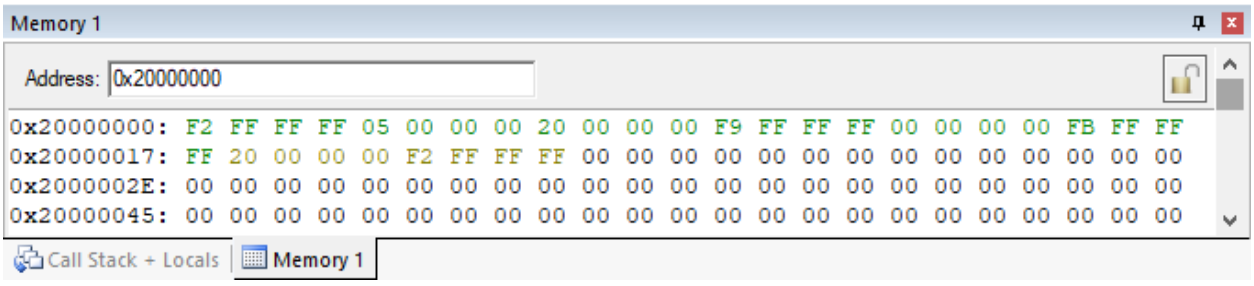
General Registers



Special Registers



Memory:



>>> The max. value in R0 is stored in memory in address 0x20000018

>>> The min. value in R1 is stored in memory in address 0x2000001C