MPCA Assignment : Unit-2

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- Section : D
- SRN : PES2UG20CS237

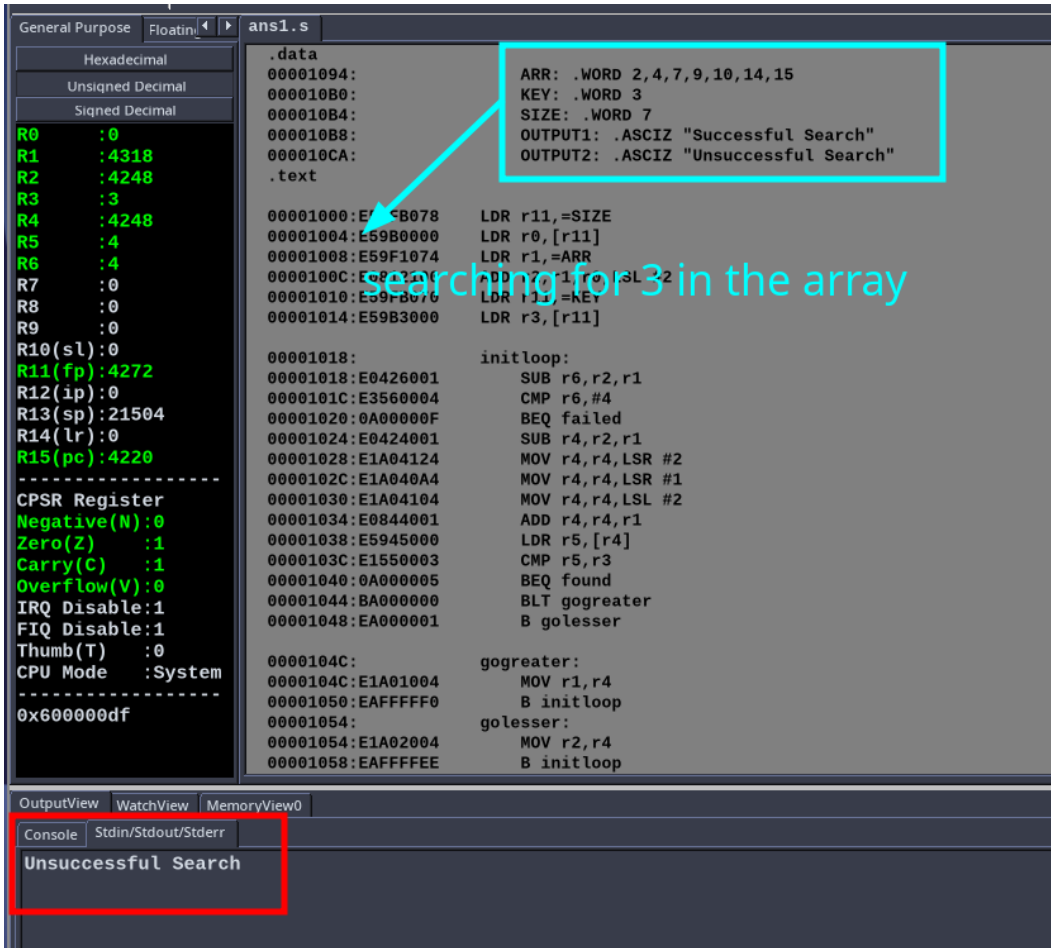
Question 1: Binary Search in ARM7RDMI Assembly

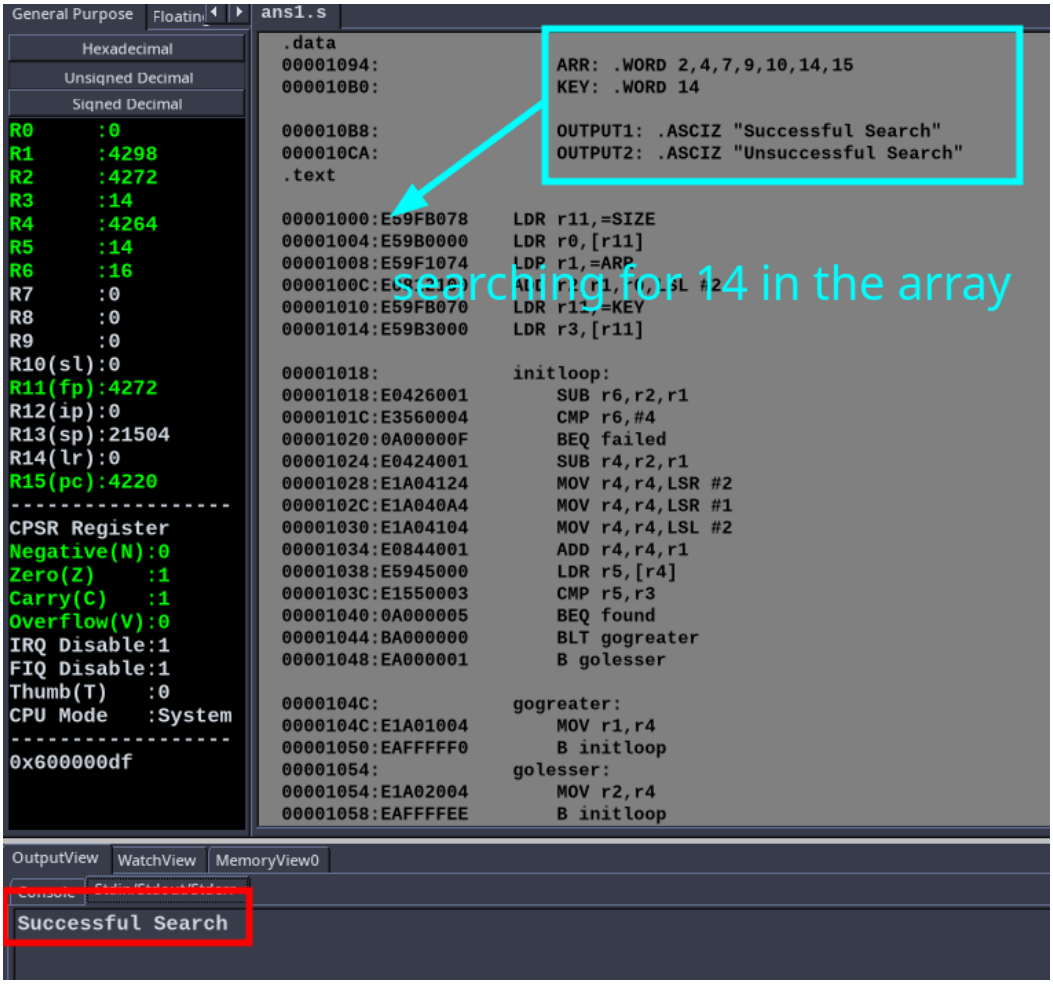
Code:

```
.data
    ARR: .WORD 2,4,7,9,10,14,15
    KEY: .WORD 14
    SIZE: .WORD 7
    OUTPUT1: .ASCIZ "Successful Search"
    OUTPUT2: .ASCIZ "Unsuccessful Search"
.text

LDR r11,=SIZE
LDR r0,[r11]
LDR r1,=ARR
ADD r2,r1,r0,LSL #2
LDR r11,=KEY
LDR r3,[r11]

initloop:
    SUB r6,r2,r1
    CMP r6,#4
    BEQ failed
```

```
    SUB r4,r2,r1
    MOV r4,r4,LSR #2
    MOV r4,r4,LSR #1
    MOV r4,r4,LSL #2
    ADD r4,r4,r1
    LDR r5,[r4]
    CMP r5,r3
    BEQ found
    BLT gogreater
    B golesser

gogreater:
    MOV r1,r4
    B initloop
golesser:
    MOV r2,r4
    B initloop
found:
    ldr r1,=OUTPUT1
    B LOOP
failed:
    ldr r1,=OUTPUT2
    B LOOP

LOOP:
    LDRB R0,[R1],#1
    CMP R0,#0
    SWINE 0x00
    BNE LOOP
    SWI 0x11

end: .end
```

Screenshots:





Question 2 : Search for a substring in a string using ARM7TDMI

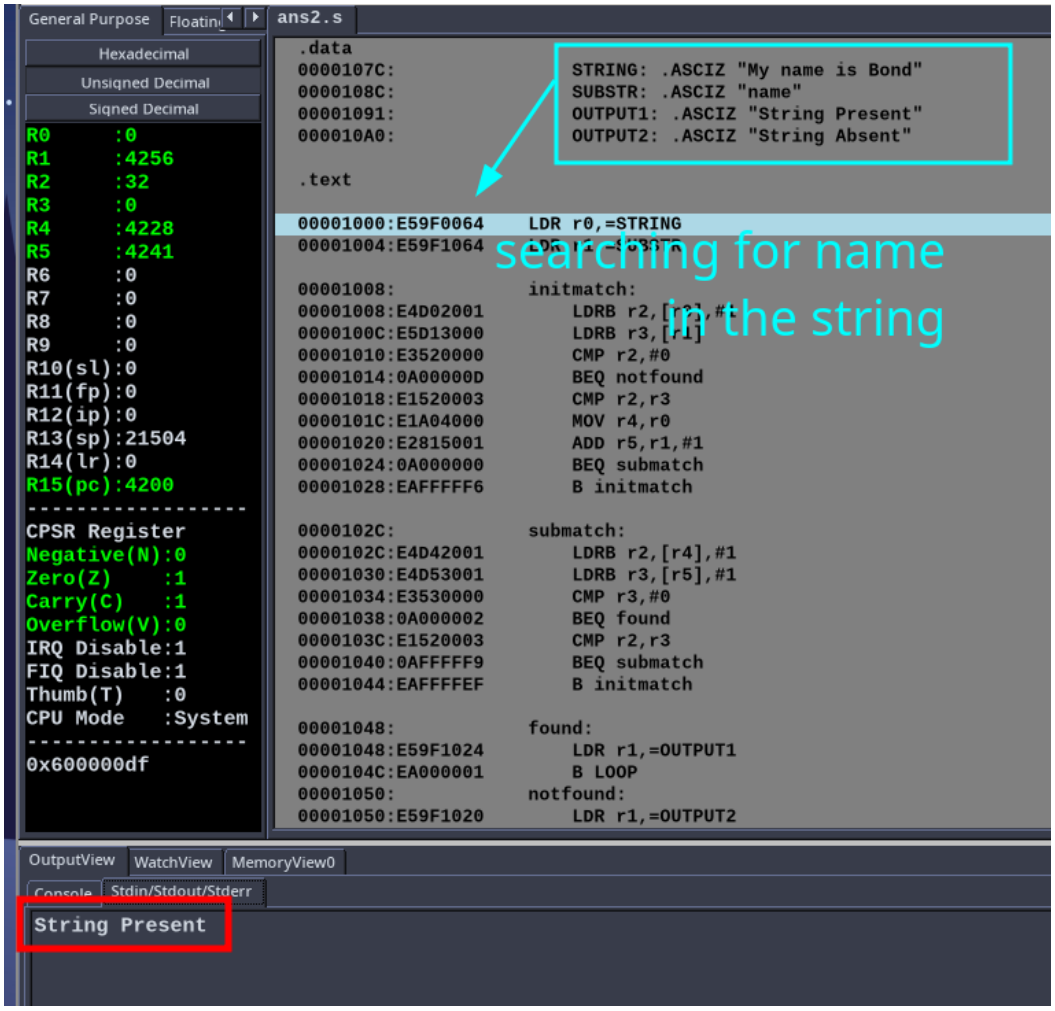
Code:

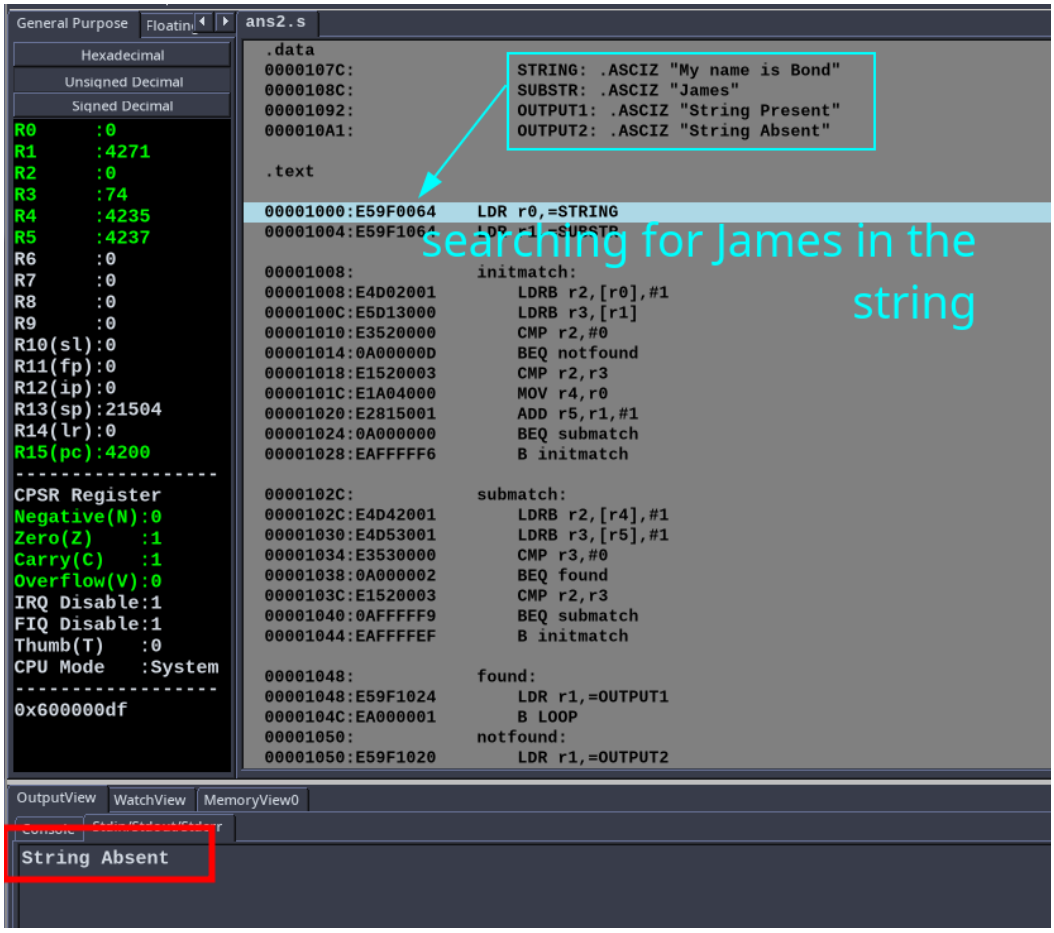
```
.data
    STRING: .ASCIZ "My name is Bond"
    SUBSTR: .ASCIZ "name"
    OUTPUT1: .ASCIZ "String Present"
    OUTPUT2: .ASCIZ "String Absent"

.text
```

```
LDR r0,=STRING
LDR r1,=SUBSTR

initmatch:
    LDRB r2,[r0],#1
    LDRB r3,[r1]
    CMP r2,#0
    BEQ notfound
    CMP r2,r3
    MOV r4,r0
    ADD r5,r1,#1
    BEQ submatch
    B initmatch

submatch:
    LDRB r2,[r4],#1
    LDRB r3,[r5],#1
    CMP r3,#0
    BEQ found
    CMP r2,r3
    BEQ submatch
    B initmatch

found:
    LDR r1,=OUTPUT1
    B LOOP
notfound:
    LDR r1,=OUTPUT2
    B LOOP

LOOP:
```

```
    LDRB R0,[R1],#1
    CMP R0,#0
    SWINE 0x00
    BNE LOOP
    SWI 0x11
```

Screenshots:




General Purpose
Floating
Hexadecimal
Unsigned Decimal
Signed Decimal
R0 :0
R1 :4271
R2 :0
R3 :74
R4 :4235
R5 :4237
R6 :0
R7 :0
R8 :0
R9 :0
R10(sl):0
R11(fp):0
R12(ip):0
R13(sp):21504
R14(lr):0
R15(pc):4200
CPSR Register
Negative(N):0
Zero(Z) :1
Carry(C) :1
Overflow(V):0
IRQ Disable:1
FIQ Disable:1
Thumb(T) :0
CPU Mode :System
0x600000df
ans2.s
.data
0000107C: STRING: .ASCIZ "My name is Bond"
0000108C: SUBSTR: .ASCIZ "James"
00001092: OUTPUT1: .ASCIZ "String Present"
000010A1: OUTPUT2: .ASCIZ "String Absent"
.text
00001000:E59F0064 LDR r0,=STRING
00001004:E59F1064 LDR r1,=SUBSTR
searching for James in the string
00001008: initmatch:
00001008:E4D02001 LDRB r2,[r0],#1
0000100C:E5D13000 LDRB r3,[r1]
00001010:E3520000 CMP r2,#0
00001014:0A00000D BEQ notfound
00001018:E1520003 CMP r2,r3
0000101C:E1A04000 MOV r4,r0
00001020:E2815001 ADD r5,r1,#1
00001024:0A000000 BEQ submatch
00001028:EAFFFFF6 B initmatch
0000102C: submatch:
0000102C:E4D42001 LDRB r2,[r4],#1
00001030:E4D53001 LDRB r3,[r5],#1
00001034:E3530000 CMP r3,#0
00001038:0A000002 BEQ found
0000103C:E1520003 CMP r2,r3
00001040:0AFFFFF9 BEQ submatch
00001044:EAFFFFEF B initmatch
00001048: found:
00001048:E59F1024 LDR r1,=OUTPUT1
0000104C:EA000001 B LOOP
00001050: notfound:
00001050:E59F1020 LDR r1,=OUTPUT2
OutputView
WatchView
MemoryView0
String Absent

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Question-3

①	LDR R1, [R2, #40]	F	D	E	M	W
②	ADD R2, R3, R3		F	D	E	M	W
③	ADD R1, R1, R2			F	D	E	M	W
④	STR R1, [R2, #20]				F	D	E	M	W

without forwarding:

a) ① & ② : Anti dependence on R2
② & ③ : true dependence on R2
② & ③ true dependence on R1
③ & ④ : output dependence on R1
① & ② " " "
① & ③ : output " " "

a) without forwarding:

① & ② : Anti dependence on R2
① & ③ : Output dependence on R1
① & ④ : true dependence on R1
if no partitioning.

② & ③ : true dependence on R2
② & ④ : true dependence on R2

③ & ④ : true dependence on R1

b) Considering Seperate I-cache & D-cache
with fwding
① & ③

without:
① ③
① ④ if no partition
② ③
② ④
③ ④

c) ① ins
② ins
NOP (mem access)
③ ins
④ ins.

→ Question: 4

a) LDR F D E M W
BEQ F D E M W
ADD discarded → F D Not executed.

F D E M W
BEQ F D E M W
STR F D E M W
AND F D E M W

b) with delay. (Branch logic in Ex stage)

LDR F D E M W
BEQ F D E M W
SAFE INSTRUCTION.
SAFE INSTRUCTION.
F D E M W
BEQ F D E M W
STR F D E M W