Final Exam Review Suggestions (Part 2)

As you prepare for the Final Exam, I recommend that you review your lecture notes (and the related examples), the readings in the textbook, and the self-study exercises.

The second segment of the course focused on the following topics:

- Assembly language basics (Harris, 6.1-6.2)
- Assembly language control constructs (Harris, 6.3)
- Assembly language functions (Harris, 6.3)
- Assembly language data organization (Harris, 6.3)

The following self-study exercises were available:

- Lab Exercise #6 -- ARM Assembly Language
- Lab Exercise #7 -- ARM Control Constructs
- Lab Exercise #8 -- ARM Subprograms
- Lab Exercise #9 -- ARM Data Movement and Organization

Prior to Exam #2, I posted study suggestions:


It might be useful to review those files, as well as your exam booklet and answers from Exam #2.

On the next five pages are 12 sample questions (the answer key is below).

13. C
14. A
15. D
16. C
17. C
18. E
19. D
20. B
21. A
22. D
23. E
24. D
13. Consider the ARM assembly language statements in Figure 2. Which of the
following correctly lists the contents of the indicated register and the
integer condition code bits after the statement labeled "Line 1" is executed?

A) r0: 9f0000f2 (base 16)   NZCV: 1010 (base 2)
B) r0: 9f0000f2 (base 16)   NZCV: 1001 (base 2)
C) r0: a00000102 (base 16)  NZCV: 1010 (base 2)
D) r0: a00000102 (base 16)  NZCV: 1001 (base 2)
E) None of the above.

14. Consider the ARM assembly language statements in Figure 2. Which of the
following correctly lists the contents of the indicated registers after the
statement labeled "Line 2" is executed?

A) r1: 2c0000088 (base 16)  r2: e5fffffc6 (base 16)
B) r1: 2c0000088 (base 16)  r2: e600003a (base 16)
C) r1: 3c0000098 (base 16)  r2: e5fffffc6 (base 16)
D) r1: 3c0000098 (base 16)  r2: e600003a (base 16)
E) None of the above.

15. Consider the ARM assembly language statements in Figure 2. Which of the
following correctly lists the contents of the indicated registers after the
statement labeled "Line 3" is executed?

A) r3: e200000d (base 16)   r4: 5c0000f8 (base 16)
B) r3: e200000d (base 16)   r4: fe0000fd (base 16)
C) r3: a2000005 (base 16)   r4: 5c0000f8 (base 16)
D) r3: a2000005 (base 16)   r4: fe0000fd (base 16)
E) None of the above.

16. Consider the ARM assembly language statements in Figure 2. Which of the
following correctly lists the contents of the indicated registers after the
statement labeled "Line 4" is executed?

A) r5: 000e6000 (base 16)   r6: 00ba0000 (base 16)
B) r5: 000e6000 (base 16)   r6: ffba0000 (base 16)
C) r5: fffe6000 (base 16)   r6: 00ba0000 (base 16)
D) r5: fffe6000 (base 16)   r6: ffba0000 (base 16)
E) None of the above.
### Figure 3

```assembly
c ldr r7, =0x456789ab

```}

// Output produced by the statement labeled "Line 1":
//
// 00020820: 44 55 66 77 88 99 aa bb cc dd ee ff 00 11 22 33
```

```assembly
  ldr r5, =LocA
  add r6, r5, #12
  ldrsh r0, [r5, #6]  
  ldrh r1, [r5, #6]  @ Line 2
  ldrsb r2, [r5, #3]  
  ldrb r3, [r5, #3]  @ Line 3
  strh r7, [r6, #-4]
  strb r7, [r6, #1]

```

```assembly
  ldr r0, =LocA
  mov r1, #16
  mov r2, #16
  bl display  @ Line 4
```

17. Consider the ARM assembly language statements in Figure 3. Which of the following correctly lists the contents of the indicated registers after the statement labeled "Line 2" is executed?

A) r0: 0000bbaa (base 16)  r1: 0000bbaa (base 16)
B) r0: 0000bbaa (base 16)  r1: ffffbbaa (base 16)
C) r0: ffffbbaa (base 16)  r1: 0000bbaa (base 16)
D) r0: ffffbbaa (base 16)  r1: ffffbbaa (base 16)
E) None of the above.

18. Consider the ARM assembly language statements in Figure 3. Which of the following correctly lists the contents of the indicated registers after the statement labeled "Line 3" is executed?

A) r2: 00000066 (base 16)  r3: 00000066 (base 16)
B) r2: 00000066 (base 16)  r3: ffffb66 (base 16)
C) r2: ffffb66 (base 16)  r3: 00000066 (base 16)
D) r2: ffffb66 (base 16)  r3: ffffb66 (base 16)
E) None of the above.

19. Consider the ARM assembly language statements in Figure 3. Which of the following is the output produced by the statement labeled "Line 4"?

A) 00020820: 44 55 66 77 88 99 45 67 89 ab 45 67 89 ab 22 33
B) 00020820: 44 55 66 77 88 99 00 00 ab 89 00 00 00 ab 22 33
C) 00020820: 44 55 66 77 88 99 ff ff ab 89 ff ff ff ab 22 33
D) 00020820: 44 55 66 77 88 99 aa bb ab 89 ee ff 00 ab 22 33
E) None of the above.
20. Consider the C language statements in Figure 4. Assuming that function "main" is to be implemented in ARM assembly language instead of C, which of the following statement sequences could be used to place the first argument in the correct location before calling function "test"?

A)  ldr   r0, =A
B)  ldr   r0, =A
    ldr   r0, [r0]
C)  mov   r0, &A
D)  mov   r0, &A
    ldr   r0, [r0]
E)  None of the above.

21. Consider the C language statements in Figure 4. Assuming that function "main" is to be implemented in ARM assembly language instead of C, which of the following statement sequences could be used to place the second argument in the correct location before calling function "test"?

A)  ldr   r1, =fmt
B)  ldr   r1, =fmt
    ldr   r1, [r1]
C)  ldr   r1, =fmt
    ldr   r1, [r1, #0]
    ldr   r2, [r1, #4]
D)  ldr   r1, =fmt
    ldrd  r1, [r1]
E)  None of the above.

22. Assume that the integer condition code bits contain 1001 (base 2). Which of the following ARM assembly language instructions would cause control to branch to function "validate"?

A)  bl    validate
B)  blmi  validate
C)  blcc  validate
D)  All of the above.
E)  None of the above.
```c
int X, Y;

if (X < 40 || Y > 80)
{
    X = Y;
}
```

23. Consider the C language statements in Figure 5. Assume the task is to be implemented in ARM assembly language instead of C. An outline of the assembly language sequence is given below:

```assembly
ldr   r0, =X
ldr   r0, [r0]
ldr   r1, =Y
ldr   r1, [r1]

@ *** Line 1 ***

endif:
```

Which of the following statement sequences is a valid replacement for the comment "*** Line 1 ***" in the sequence?

A)  ```assembly
    cmp   r0, #40
    ble   endif
    cmp   r1, #80
    bge   endif
    ldr   r0, =X
    str   r1, [r0]
```  

B)  ```assembly
    cmp   r0, #40
    blt   endif
    cmp   r1, #80
    bgt   endif
    ldr   r0, =X
    str   r1, [r0]
```  

C)  ```assembly
    cmp   r0, #40
    bge   endif
    cmp   r1, #80
    ble   endif
    ldr   r0, =X
    str   r1, [r0]
```  

D)  ```assembly
    cmp   r0, #40
    bgt   endif
    cmp   r1, #80
    blt   endif
    ldr   r0, =X
    str   r1, [r0]
```  

E)  None of the above.
struct Student
{
    char Name[25];
    int ID;
    int Points;
};

int exam( struct Student List[], int I )
{
    return List[I].ID;
}

24. Consider the C language statements in Figure 6. Assume function "exam" is to be implemented in ARM assembly language instead of C. A stub for function "exam" is given below:

```assembly
.global exam
.text
.balign 4
exam:
    push    {lr}
@ *** Line 1 ***
    pop     {lr}
    bx      {lr}
```

Which of the following statement sequences is a valid replacement for the comment "*** Line 1 *** in function "exam"?"

A) mov r3, #29
    mul r3, r1, r3
    add r2, r0, r3
    ldr r0, [r2, #25]

B) mov r3, #30
    mul r3, r1, r3
    add r2, r0, r3
    ldr r0, [r2, #26]

C) mov r3, #33
    mul r3, r1, r3
    add r2, r0, r3
    ldr r0, [r2, #25]

D) mov r3, #36
    mul r3, r1, r3
    add r2, r0, r3
    ldr r0, [r2, #28]

E) None of the above.