   a. In straightforward English, explain what the LSL (immediate) instruction does. [4 points]
   b. Write the hexadecimal for the machine code you would except to get for the following instructions.
      [6 points, 2 each]
      a. LSR R2, R3, #3
      b. LSR R2, R3, #23
      c. LSR R11, R3, #3

2. For each of the following program segments, assume you start with all memory locations in question equal to zero. Indicate the values found in these memory locations when the programs end. Write all answers in hex. [10 points, 5 for each part]
   a. BASE_EM C = 0x74000000;
      uint32_t *x = (uint32_t*)BASE_EM C;
      *x = 0x76543210;
      *(x-1) = 0x89abcdef;

      | Base Address | 00 | 01 | 02 | 03 |
      |--------------|----|----|----|----|
      | 0x74000004   |    |    |    |    |
      | 0x74000000   |    |    |    |    |
      | 0x73FFFFFFC  |    |    |    |    |
      | 0x73FFFFFF8  |    |    |    |    |
b. mov r2, #100
    movw r1, #255
    movt r1, #15
    strb r1, [r2, 2]!
    str r1, [r2], #1
    strh r2, [r2, #-3]

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<tr>
<th>Address</th>
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Hint: The ARMv7-M Architecture Reference Manual may be useful here.

3. Write a program in UAL assembly that does the same thing as the following C code. You should assume “print” is an ABI compliant function that takes a single integer argument and does something with it. Have the main return to whatever called it just as any function might. Do not use IT statements or conditional instructions (e.g. ADDNE). [10 points]

```c
void main() {
    int i, a=1;
    for(i=0; i<5; i++) {
        a = a + i;
        print(a);
    }
}
```

4. Write a program in C that does the same thing as the following ARM assembly language code. Your C code must not exceed three lines. [10 Points]

```c
movw r0, #0030
movt r0, #2008
ldr r1, [r0]
add r1, r1
str r1, [r0]
```

5. Write an ABI compliant function named “mean” which takes four integer arguments and returns the average of the four. Do not worry about fractions or overflow. [10 points]