Tutorial 5

1. Please complete the following table with instructions used for each operation.

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</table>

2. How do you setup a port to act as an input port or as an output port in AVR? What instructions are used to read from an I/O port? What instructions are used to write to an I/O port?

3. Consider the following example AVR code segment:

```assembly
Address
0x1000 .def grade=r20
0x1002 .include "m64def.inc"
0x1004 LDI r29,high(RAMEND)
0x1006 LDI r28,low(RAMEND)
0x1008 OUT SPH,r29
0x100A OUT SPL,r28
0x100C LDI r18,45
0x100E RCALL GRADE_CAL
   end:
0x1010 RJMP end
   GRADE_CAL:
0x1012 PUSH r29
0x1014 PUSH r28
0x1016 CPI r18,50
0x1018 BRGE grade1
0x101A LDI grade,2
0x101C RJMP exit
   grade1:
0x101E LDI grade,1
   exit:
0x1020 POP r28
0x1022 POP r29
0x1024 RET
```

What are the values of r28, r29, SPL and SPH:

a) after line “LDI r28,low(RAMEND)”?

b) after line “OUT SPL,r28”?

c) after line “BRGE grade1”?
d) after line “POP r29”?