

4. RAT ASM and Memory (15)

Figures 1 and 2 show the current contents of the register file and of the scratch pad memory. The following program is executed.

```

;-----
;- Memory Designation Constants
;-----
.DSEG
.ORG      0x00
;-----

;-----
;- Main program
;-----
.CSEG
.ORG      0x57

      ST      R1, (R4)
      ROR     R5
      LD      R4, (R3)
label: EXOR    R4, R30
      BRNE   label

```

1. Write the machine code for each instruction and fill in the prog_rom using 5 hex values. If there are any don't cares in the instruction, use '0' for the don't care. Label the address of each row you fill in.
2. Modify the register contents in the figures to show how the register contents and memory contents change as a result of execution.

0	0x08
1	0x62
2	0x0F
3	0x00
4	0x02
5	0xFD
.	
.	
30	0x32
31	0x44

Register File

0	0x23
1	0x11
2	0xF9
3	0x1F
4	0x54
.	
.	
253	0x0B
254	0x28
255	0x54

Scratch Pad Memory

0	
.	
.	
.	
.	
.	
.	
.	
.	
0x3FF	

Program Memory

5. RAT ASM Interpretation (10)

Assume that the register R3 is initialized to 19 and the register R2 is initialized to zero. What is the value in R2 when the code reaches done? Explain your answer.

```
        MOV    R1, 0x00
loop:   CMP    R1, R3
        BRCS   else
        BRN    done
else:   ADD    R2, 0x02
        XOR    R2, 0x0A
        SUB    R3, 0x01
        BRN    loop
done:
```