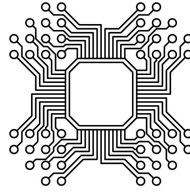


SERIE 2 – INSTRUCTION ENCODING

Information systems



Question 1 – Fiddling with bits

(a) Convert to hexadecimal the following binary number:

1) 0b0011 0111

1) _____

2) 0b0101 1111

2) _____

3) 0b1110 0100 1101 1001

3) _____

(b) Convert to binary the following decimal number:

1) 5

1) _____

2) 12

2) _____

3) 257

3) _____

4) -1 (using 8 bits)

4) _____

(c) Which numbers represent the ASCII 'z' character?

- The hexadecimal number 0x5A
- The binary number 0b01111010
- The hexadecimal number 0xA7
- The hexadecimal number 0x7A

Question 2 – Instructions encoding

How are the following instructions encoded and what is their meaning?

(a) `movlw .10`

.....
.....

(b) `movf 0x0, 0`

.....
.....

(c) `movf 0x0, 1`

.....
.....

(d) `andwf 0x2, W, 0`

.....
.....

Question 3 – Instruction effects

Given are the following instructions, starting at address 0 in program memory:

```

1  movlw  .10
2  movwf  0x03
3  incf   0x00, F

```

(a) Give the encoding of those instructions and the program memory content in hexadecimal.

.....
.....
.....
.....
.....

Question 4 – Reverse engineering

(a) Consider the following PIC18 program memory content

```

0000  9E93
0002  28E8
0004  6E8A
0006  EF01
0008  F000

```

(b) What is the original code of this assembled program? Note that WREG is at address 0x0FE8, TRISB at address 0x0F93 and LATB at address 0x0F8A.

.....
.....
.....

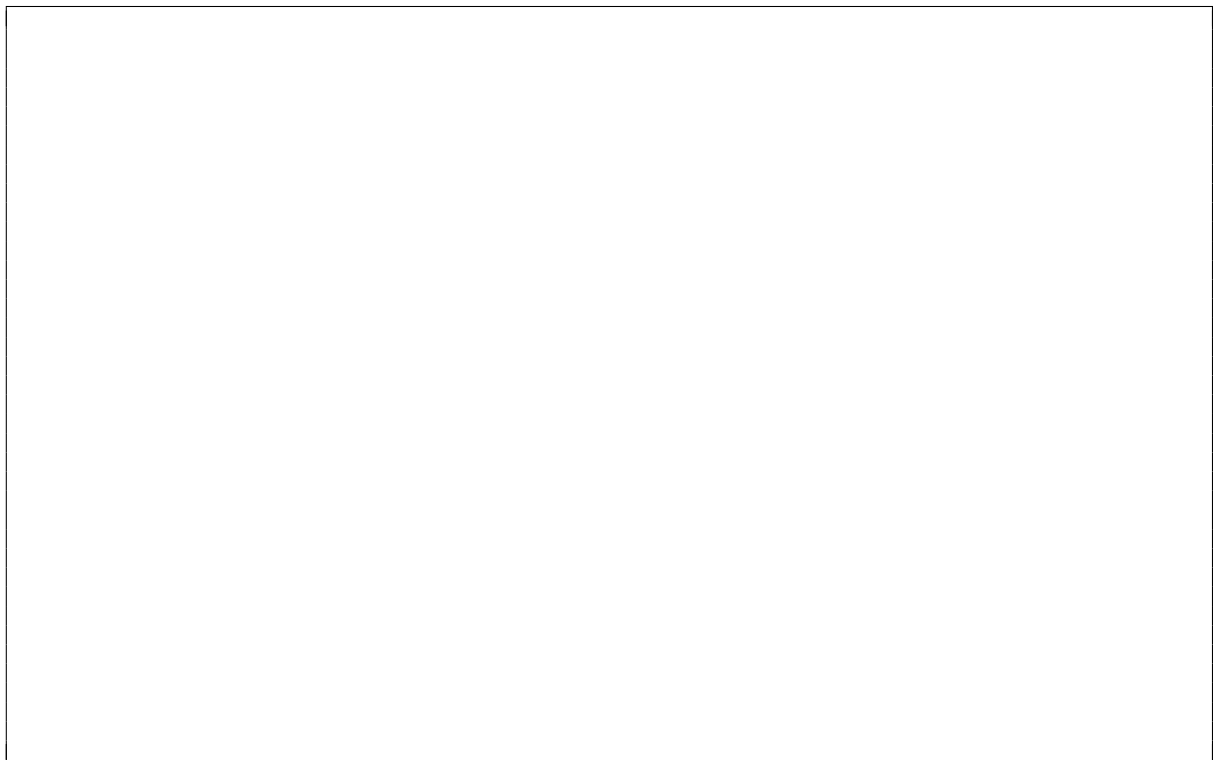
Question 5 – Understanding an assembly program

Consider the following assembly program:

```

1  x equ 0x0
2  y equ 0x1
3
4  init:
5      clrf    y
6      movlw  .4
7      movff  WREG, x
8
9  dec_loop:
10     incf   y
11     incf   y
12     dcfsnz x
13     goto  loop
14     goto  dec_loop
15
16  loop:
17     goto  loop
18
19     end
    
```

(a) Draw the flowchart diagram of this program



(b) What is the purpose of the `clrf` instruction in this code ?

.....

(c) What is the content of the memory address 1 when the program reaches the loop at the end ?

.....