Problem Set #2

Part I. Answer the following questions by marking the best answer among the choices given:

1. We can toggle bit 4 of P4 by the following C instruction …
a) P4= P4 ^ 008H
b) P4= P4 & 0F7H
c) P4.4= ~P4.4

2. When the microcontroller starts and finds out that its external clock source is invalid, …
a) It switches automatically to internal oscillator
b) It can be configured to reset
c) It causes a flag to be raised for the program to repair the problem

3. GPIO pins can be used for input data transfer when they are configured as …
a. Open-drain mode with internal weak pull-ups
b. Open-drain mode with external pull-ups
c. Push-pull mode

4. When the microcontroller running from an external crystal oscillator finds out that its external clock source is invalid, …
a. It switches automatically to internal oscillator
b. It can be configured to reset
c. It causes a flag to be raised for the program to repair the problem.

5. To enable synchronization between multiple devices, a … source is used.
a. CMOS clock
b. RC oscillator
c. Crystal oscillator

Part II. Mark the following statement as either True (T) or False (F):

10. Microcontroller clock configuration must perform a check on the external clock validity
11. `sbit` variable can only declare global variables
12. One can declare an array of bits in C language programming for microcontrollers
13. Default C8051F020 GPIO state upon reset is Push-Pull
14. The operands of a relational operation must be Boolean.

Part III. Compute the output of the following operations in a C Language program for a C8051F020 device:

```
15.     !(00100100b && 00000001b)
16.     (0F0H - 080H) != 0
17.     0FFH % 04H
18.     018H<<2
19.     (0FE20H | 080H)
```

```
20.        01000100b & 10100001b
21.      (0F0H ^ 00AH) _ 011H
22.      !(0AAH)
23.      ~(0F0H & 0A0H)
24.      0FFH ^ 10101010b
25.      00100100b & 10100001b
26.      0F0H _ 05AH
27.      055H >= 0A0H
28.      ~0AAH
29.      00100100b ^ 10100001b
30.      !(00100100b | 00000001b)
31.      (0F0H & 080H) >= 0
32.      0F1H % 02H
33.      17<<2
34.      (0FEA0H && 080H)
35.      00100100b && 10100001b
36.      0F0H + 00AH
37.      055H & 0AAH
38.      ~0F0H
39.      0F0H ^ 10100001b
40.      !(00100100b & 00000001b)
41.      (0F0H - 080H) == 0
42.      0ABH % 04H
43.      040H>>2
44.      (0FEA0H & 080H)
```

Part IV. Consider a project in which the 4-bit digital data from an A/D is connected to pins 4-7 of port 1 of your C8051F020 ToolStick University Daughter Card. Write a program that inputs the value of the digital data lines connected to P1.4-P1.7 and turns on/off the corresponding LEDs connected to P5.4-P5.7 based on the value read. (That is, if the P1.0 is 1 then the LED at P5.4 is lit, and if the P1.4 is 0 then the LED P5.4 is off, and so on for the other pins).