

Question 1

Complete

Points out of
12.00

Flag question

Write a code segment to read data from a memory location in the ACCESS bank onto WREG in two alternate forms by using:

- The BSR register
- The "a" bit in the instruction
- Explain the main purpose of why the concept of the ACCESS bank exists in the PIC 18F architecture and its use through the "a" bit is more efficient.

a)

```
movlb 0xF
```

```
movf PARTA, 0(w), 1
```

b)

```
movf PORTA, 0, 0
```

c)

Access bank allows one to access several general purpose registers (GPRs) and all of the special function registers (SFRs) without doing a bank switch. If the program does not need to use a large number of GPRs, then there is no need for bank switching at all. As can be seen from the examples above, bank switching requires an extra instruction and is therefore less efficient and can be more error-prone. The access bank significantly mitigates these problems.

Question 2

Complete

Points out of
20.00

Flag question

A piece of PIC assembly code is given as follows:

 Code

What are the contents of NUM1, NUM2, STATUS and Working Register (WREG), right after the execution of the instructions at line 4, 7, 9, 11 and 13?

Assume that

- NUM1 and NUM2 are located at addresses 0x23 and 0x32, respectively,
- STATUS = 0xBA, WREG = 0x23, NUM1 = 0x32 and NUM2 = 0x23 before the execution of the instruction at line 1,
- No interrupt occurs during the execution of this code segment.

Give your answer by filling below table. Use **only hexadecimal** notation and give **exact** answers.

Line number of last executed instruction	NUM1	NUM2	STATUS	W
1	0x23	0x23	0x1A	0x23
4	0x23	0	0x1E	0x23
7	0x23	0xFF	0x10	0xFE
9	0x23	0x00	0x07	0x01
11	0x91	0x00	0x03	0x31
13	0x92	0x00	0x10	0x62

Question 3

Complete

Points out of
10.00

Flag question

On a PIC18, if a timer is loaded with 100 (decimal) and counts up to 200 and the timer clock frequency ($F_{osc}/4$) is 2MHz, what is the time calculated? Assume that both pre- and post-scalers are equal to 1. Show your work.

 $1/2\text{Mhz} = 500\text{ns}$
 $100 * 500 = 50000 \text{ ns}$
 50microsecond

Question 4

Complete

Points out of
10.00

🚩 Flag question

Calculate the total number of instruction cycles from label a to b in the given program and explain your calculation (just a result gets zero credit):

a:

movlw 0x08**movwf 0x20**

here:

decfsz 0x20,f**goto here****nop**

b:

So in total: $2 + 21 + 3 + 1 = 27$

Question 5

Complete

Points out of
15.00

🚩 Flag question

Answer the following questions:

- Write instructions to set up INT1 with low priority and INT2 high-priority and clear 0x01 to set up as an up counter and load 0x02 with 30H.
- Write ISR for INT1 to count up to 30 and then clear the counter.
- Write ISR for INT2 to count from 30H to 0, and when the counter reaches zero, reset the counter to 30H. Assume all register are in Access Bank.

a)

clrf 0x01

movlw 0x30

movwf 0x02

movlw 10011000B

movwf INTCON3 ; int2 high, int1 low, enable both, clear both

clrf RCON

bsf RCON, RCON_IPEN_POSITION

movlw 0xC0 ; enable priorities

movwf INTCON ; enable interrupts

b)

btfss INTCON3, INTCON3_INT1IF_POSITION

retfie ; only respond to INT1

bcf INTCON3, INTCON3_INT1IF_POSITION ; clear the interrupt flag

movwf 0x03 ; use this for saving the original value of wreg

movlw 0x30 ; this is the value to compare against

incf 0x01 ; increment

cpfslt 0x01 ; if the contents of 0x01 is less than 0x30, skip the next instruction

clrf 0x01

movf 0x03, 0 ; restore the wreg

retfie

c)

btfss INTCON3, INTCON3_INT2IF_POSITION

retfie 1 ; only respond to INT2

bcf INTCON3, INTCON3_INT2IF_POSITION ; clear the interrupt flag

decfsz 0x02

retfie 1

movlw 0x30 ; decrement, if the contents of 0x02 is zero skip the next instruction

movwf 0x02 ; reset the counter back to 0x30

retfie 1

Question 6

Complete

Points out of 3.00

Flag question

What is the effect of executing the following instructions?

```
movlw b'11110000'
```

```
movwf TRISB
```

Pins 7:4 of Port B are set as input and the others are set as output

Question 7

Complete

Points out of 6.00

Flag question

A snippet of PIC assembly is given as follows:

```
1 movlw 0x5A
2 addwf VAR1, 1
3 swapf STATUS
4 movlw 0x00
5 rrcf VAR1
```

What are the contents of VAR1, STATUS and Working Register (WREG), **right after the execution of the instructions** at lines 2, 3, 5?

Assume that:

- VAR1 is located at address 0x22.
- No interrupt occurs during the execution of this code segment.

Give your answer by filling the below table.

Line Number of Last Executed Instruction	VAR1	WREG	STATUS
1	0x96	0x5A	0x00
2	0xF0	0x5A	0x12
3	0xF0	0x5A	0x21
5	0xF8	0x00	0x10

Question 8

Complete

Points out of 4.00

Flag question

In PIC18, **most** of the instructions are _____ bit(s) long and are executed in _____ instruction cycle(s).

Select one:

- ☐ 16, 2
- ☒ 16, 1
- ☐ 21, 1
- ☐ 21, 2
- ☐ 8, 1

Question 9

Complete

Points out of
4.00

🚩 Flag question

What will be the decimal value of the data register at address 0x301 after the following code is executed. Assume all data registers initially have a value of zero.

```
MOVLW 0x0A
LFSR FSR0, 0x300
ADDWF POSTINC0, F
ADDWF POSTINC0, F
ADDWF POSTINC0, F
ADDWF POSTINC0, F
```

Select one:

- ☐ 0
- ☒ 10
- ☐ 20
- ☐ 40
- ☐ 30

Question 10

Complete

Points out of
4.00

🚩 Flag question

Assuming that the current value of PC (program counter) is 56 (in decimal), what will be its new value (again in decimal) after the following code is executed:

```
MOVLW 0x34
SUBLW 0x35
BC 0x12
```

Select one:

- ☐ 74
- ☐ 76
- ☐ 58
- ☒ 98
- ☐ 78

Question 11

Complete

Points out of
3.00

🚩 Flag question

Assume that you want to create a time delay without using timers. You are using a PIC device with 32-Mhz oscillator clock frequency. For this purpose you write the following code snippet:

```
MOVLW D'FIND_THIS_NUMBER' ; write decimal FIND_THIS_NUMBER to WREG
MOVWF 0x00
time_delay_loop:
    NOP
    NOP
    DECFSZ 0x00
    BRA time_delay_loop
```

You want your code to spend about 10 microseconds in this loop. What decimal number is most suitable to choose for FIND_THIS_NUMBER?

Select one:

- ☐ 8
- ☐ 64
- ☐ None of the others
- ☐ 32
- ☒ 16

Question **12**

Complete

Points out of
4.00

🚩 Flag question

Imagine an 8-bit timer which is set to start at timer value of zero. The prescaler is set to 1:4 and postscaler is set to 1:2. Assuming that the timer is programmed to generate timer interrupts at overflow, how many times the interrupt will be generated when the timer's input clock makes 65536 pulses?

Select one:

- ☐ 256
- ☐ 128
- ☒ 32
- ☐ 16
- ☐ 64

Question **13**

Complete

Points out of
1.00

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In PIC18, Data Memory is divided into banks of bytes long.

Question **14**

Complete

Points out of
2.00

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The majority of the access bank in PIC18F4620 (our PIC) contains special function registers.

Select one:

- ☐ True
- ☒ False

Question **15**

Complete

Points out of
2.00

🚩 Flag question

A program running on the PIC device cannot write data to the program memory during execution. It has to be done offline.

Select one:

- ☐ True
- ☒ False