



كلية الهندسة

Faculty of Engineering



جامعة الأهرام الكندية
AHRAM CANADIAN UNIVERSITY

Model Answer

Course name: Microcontrollers

Exam number: Midterm - Fall 2017

Course Code: ECE401

Exam Date: Nov 2016

Lecturer: Dr. Ahmed ElShafee

Time Allowed: 60 minutes

ID:

Name:

MCQ	Problems		Total
	Q1	Q2	
20	5	5	30

Part 1: MCQ

Highlight your answer in the following table (Answer only 20 questions)

#	A	B	C	D	E	F	G	
1	<input checked="" type="radio"/>							a
2				<input checked="" type="radio"/>				d
3		<input checked="" type="radio"/>						b
4		<input checked="" type="radio"/>						b
5			<input checked="" type="radio"/>					c
6		<input checked="" type="radio"/>						b
7	<input checked="" type="radio"/>							a
8		<input checked="" type="radio"/>						b
9	<input checked="" type="radio"/>							a
10		<input checked="" type="radio"/>						b
11			<input checked="" type="radio"/>					c
12		<input checked="" type="radio"/>						b
13				<input checked="" type="radio"/>				d
14			<input checked="" type="radio"/>					c
15			<input checked="" type="radio"/>					c
16			<input checked="" type="radio"/>					c
17			<input checked="" type="radio"/>					c
18	<input checked="" type="radio"/>							a
19		<input checked="" type="radio"/>						b
20			<input checked="" type="radio"/>					c
21				<input checked="" type="radio"/>				d
22			<input checked="" type="radio"/>					c
23		<input checked="" type="radio"/>						b
24		<input checked="" type="radio"/>						b
25		<input checked="" type="radio"/>						b

(Answer only 20 questions)

#		
1	How many clock pulses are confined by each machine cycle of Peripheral-Interface Controllers? a. 4 b. 8 c. 12 d. 16	a
2	Which flags are more likely to get affected in status registers by Arithmetic and Logical Unit (ALU) of PIC 16F84 on the basis of instructions execution? a. Carry (C) Flags b. Zero (Z) Flags c. Digit Carry (DC) Flags d. All of the above	d
3	What is the execution speed of instructions in PIC especially while operating at the maximum value of clock rate, considering that used crystal is 20MHz? a. 0.1 μ s b. 0.2 μ s c. 0.4 μ s d. 0.8 μ s	b
4	Which operational feature of PIC allows it to reset especially when the power supply drops the voltage below 4V? a. Built-in Power-on-reset b. Brown-out reset c. Both a & b d. None of the above	b
5	Which timer/s possess an ability to prevent an endless loop hanging condition of PIC along with its own on-chip RC oscillator by contributing to its reliable operation? a. Power-Up Timer (PWRT) b. Oscillator Start-Up Timer (OST) c. Watchdog Timer (WDT) d. crystal oscillator (XT)	c

6	Which among the CPU registers of PIC 16C6X/7X is not 8-bit wide? a. Status Register b. Program Counter Latch (PCLATH) Register c. Program Counter Low Byte (PCL) Register d. File Selection Register (FSR)	b
7	Which register/s is/are mandatory to get loaded at the beginning before loading or transferring the contents to corresponding destination registers? a. W b. INDF c. PCL d. All of the above	a
8	How many RPO status bits are required for the selection of two register banks? a. 1 b. 2 c. 8 d. 16	b
9	The RPO status register bit has the potential to determine the effective address of _____ a. Direct Addressing Mode b. Indirect Addressing Mode c. Immediate Addressing Mode d. Indc. Watchdog Timer (WDT) exed Addressing Mode	a
10	Which status bits exhibit carry from lower 4 bits during 8-bit addition and are especially beneficial for BCD addition? a. Carry bit (C) b. Digits Carry bit (DC) c. Both a & b d. None of the above	b
11	Where do the contents of PCLATH get transferred in the higher location of program counter while writing in PCL (Program Counter Latch)? a. 11th bit b. 12th bit c. 13th bit d. 14th bit	c

12	<p>Which condition/s of MCLR (master clear) pin allow to reset the PIC?</p> <p>a. High b. Low c. Moderate d. All of the above</p>	b
13	<p>Which significant feature/s of crystal source contribute/s to its maximum predilection and utility as compared to other clock sources?</p> <p>a. High accuracy b. Proficiency in time generation c. Applicability in real-time operations d. All of the above</p>	d
14	<p>How many bits are required for addressing 2K & 4K program memories of PIC 16f84 respectively?</p> <p>a. 4 & 8 bits b. 8 & 16 bits c. 11 & 12 bits d. 12 & 16 bits</p>	c
15	<p>When do the special address 004H get automatically loaded into the program counter?</p> <p>a. After the execution of RESET action in program counter b. After the execution of 'goto start' instruction in the program memory (start @ org 0000) c. At the occurrence of interrupt into the program counter d. At the clearance of program counter with no value</p>	c

16	<p>Which registers are adopted by CPU and peripheral modules so as to control and handle the operation of device</p> <p>a. General Purpose Register b. Special Purpose Register c. Special Function Registers d. All of the above</p>	c
17	<p>Which register acts as an input-output control as well as data direction register for PORTA in bank 1 of RFS?</p> <p>a. INDF (80H) b. TRISB (85H) c. TRISA (85H) d. PCLATH (8A)</p>	c
18	<p>When does it become possible for a bit to get accessed from bank '0' in the direct addressing mode of PICs?</p> <p>a. Only when RPO bit is set 'zero' b. Only when RPO bit is set '1' c. Only when RPO bit is utilized along with 7 lower bits of instruction code d. Cannot Predict</p>	a
19	<p>Which instruction is applicable to set any bit while performing bitwise operation settings?</p> <p>a. bcf b. bsf c. Both a & b d. None of the above</p>	b
20	<p>Where is the result stored after an execution of increment and decrement operations over the special function registers in PIC?</p> <p>a. File Register b. Working Register c. Both a & b d. None of the above</p>	c

21	<p>Which flags of status register are most likely to get affected by the single-cycle increment and decrement instructions?</p> <p>a. P Flags b. C Flags c. OV Flags d. Z Flags</p>	d
22	<p>Where is the result stored after an execution of addition and subtraction operations over the special function registers in PIC?</p> <p>a. File Register b. Working Register c. Both a & b d. None of the above</p>	c
23	<p>Where is the result stored after an execution of addition and subtraction operations over literal value in PIC?</p> <p>a. File Register b. Working Register c. Both a & b d. None of the above</p>	b
24	<p>For the following C code</p> <pre>For(int n=0;n<7;n++) { // do something }</pre> <p>To build this code in assembly, the most equivalent instruction to be used to implement that loop is</p> <p>a) incfsz b) decfsz c) goto d) call</p>	b



25	<p>The following code</p> <pre><i>BSF STATUS,RPO</i> <i>MOVLW H'11'</i> <i>MOVWF TRISB</i></pre> <p>Used for</p> <ul style="list-style-type: none">a) write high on 1st and 5th pins of port bb) enable input at 1st and 5th pins of port bc) read values on 1st and 5th pins of port bd) write low on 1st and 5th pins of port b	b
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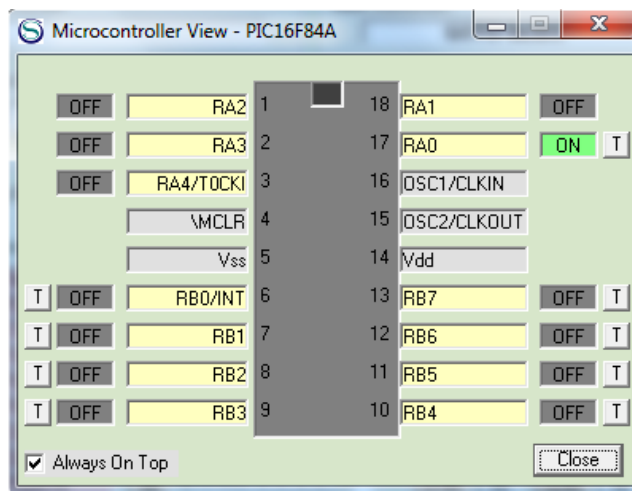
Part 2: problems:

Q1 A 220V AC lamp is placed on the top of telecommunication tower in to alert plans during the night, this lamp is called Beacon Lamp.
You are required to build a control board uses 16F84A microcontroller to drive an 220 V AC beacon lamp. MC is connected to photocell (photo resistor “LDR”) to surrounded detect light intensity.
Microcontroller will monitor the feedback from photocell (daylight = 0, night=1), it will turn off the beacon lamp in the presence of daylight, and beacon will flash (delay 1 sec) during the night.
Write a C program that implements Beacon Controller.
Consider the following

MC pin	Interfaced to
RA0	Photocell
RA1	Beacon Lamp

Status	MC input
Day light	0
Night	1

Status	MC output
Beacon on	1
Beacon off	0



lamp interface
photocell interface

```
... #include <xc.h>
... #include <pic16f84a.h>
... void main(void) {
...     // RA0 : PhotoCell
...     // RA1 : Beacon
...     // configure portA
...     TRISA=0x01;
...     //endless loop
...     while(1)
...     {
...         // check photo cell for daylight
...         if(RA0==0)
...         {
...             // turn beacon off
...             RA1=0;
...         }
...         // check photo cell for night
...         else
...         {
...             // turn photo cell on
...             RA1=1;
...             // delay
...             _delay(1000000);
...             // turn photo cell off
...             RA1=0;
...             // delay
...             _delay(1000000);
...         }
...     }
... }
```




```
#include <xc.h>
#include <pic16f84a.h>
void main(void) {
    // RA2 : up
    // RA3 : down
    // configure portA
    TRISA=b'00001100';
    // configure portb
    TRISB=0xff;
    while(1)
    {
        if(RA2==0)
        {
            If(portb<0x80)
                portB=portB<<1;
        }
        Else if(RA3==0)
        {
            If(portb>0x01)
                portB=portB<<1;
        }
        _delay(100000);
    }
}
```




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