0907333 Embedded Systems (Summer 2012)
Quiz 2B

الاسم: رقم التسجيل: الرقم التسلسلي: الشعبة:

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Instructions: Time **20** minutes. Open book and notes exam. No electronics. Please answer all problems in the space provided and limit your answer to the space provided. **No questions are allowed**.

Q1. Modify the following algorithm to solve the key bouncing problem. Assume that bouncing does not last more than 10 ms.

<1 mark>

Set column bits as outputs
↓
Set row bits as inputs
↓
Set column bits to 0
↓
Read row bits
↓
Set column bits as inputs
↓
Set row bits as outputs
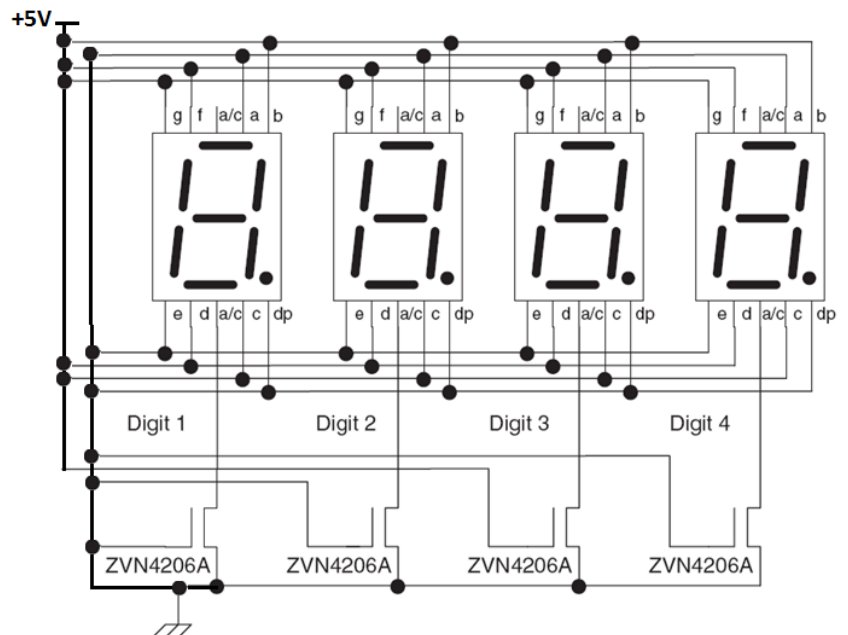↓
Set row bits to 0
↓
Read column bits
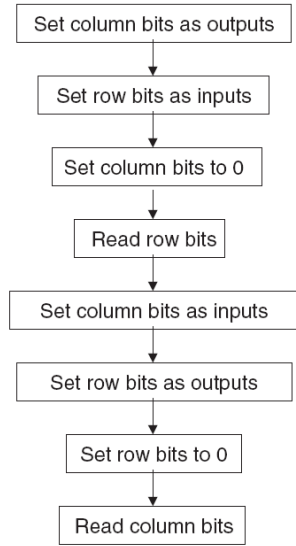
Perform a 10-ms delay at the end of this algorithm.

Q2. What happens when the following circuit is powered up? Assume that the circuit uses the 7-segment display described in the class.

<1 mark>

Only Digit 3 is active and shows letter y; only segments b, c, d, f, and g are on.

Note that current limiting resistors are missing, which may lead to burning the LEDs.

Q3. The Derbot shaft encoder generates 16 pulses per revolution and generates 91 pulses when it travels for one meter. What is its wheel's radius?

<div align="right"><i><1 mark></i></div>

Circumference= (16/91) * 1m = 16/91, Circumference = 2*PI*r^2, r = SQRT(Cir/(2*PI))

No need to find the final answer.

Q4. A) What is the main advantage of brushless DC motor over brushed DC motor? <i><2 marks></i>

____**Less maintenance** _____

   B) What is the main advantage of brushed DC motor over brushless DC motor?

____**Less expensive** _____

Q5. What is the minimum sampling rate that a PIC16F873A microcontroller should use with a signal that has frequency spectrum in the range from 1 KHz to 2 KHz?

<div align="right"><i><1 mark></i></div>

F$_{sampling}$ >= 2 * 2 KHz = 4KHz

Q6. Configure the following three registers of the PIC16F873A microcontroller's CCP1 module to generate repetitive interrupt stream at 2^{10} Hz. Assume that f$_{osc}$ = 2^{22} Hz is used and prescaling is not used. Below each bit of CCP1CON, enter 0, 1, or x.

<div align="right"><i><4 marks></i></div>

CCP1CON:

U-0	U-0	R/W-0	R/W-0	R/W-0	R/W-0	R/W-0	R/W-0
—	—	CCPxX	CCPxY	CCPxM3	CCPxM2	CCPxM1	CCPxM0
bit 7							bit 0
_x_	_x_	_x_	_x_	_1_	_0_	_1_	_1_

CCPR1L = __**1111 1111**_____,   CCPR1H = ___**0000 0011**_____

Needed frequency division = (2^{22} / 4) / 2^{10} = 2^{10}
CCPR1 = 210 – 1 = 100 0000 0000 = 11 1111 1111

1 for each of (CCPxX and CCPxY), CCPxM, CCPR1L, and CCPR1H.

<div align="center"><i><Good Luck></i></div>