



UNIVERSITI TUN HUSSEIN ONN MALAYSIA

**FINAL EXAMINATION
SEMESTER II
SESSION 2012/2013**

COURSE NAME : MICROPROCESSOR AND
MICROCONTROLLER

COURSE CODE : BEC 30403/BEE 3233/BEX 32003

PROGRAMME : BEC / BEE

EXAMINATION DATE : JUNE 2013

DURATION : 3 HOURS

INSTRUCTION : ANSWER ALL QUESTIONS

THIS QUESTION PAPER CONSISTS OF SEVEN (7) PAGES

- Q1**
- (a) Sketch the process that shows the literal value and working register being fed to the PIC16F877 ALU. (2 marks)
- (b) Explain the process of stack level in PIC16F877. (3 marks)
- (c) Find the suitable value for PR2 and the prescaler needed to get the following PWM frequencies. Assume XTAL = 20MHz. (6 marks)
- (i) 1.22kHz
 - (ii) 4.88kHz
 - (iii) 78.125kHz
- (d) Construct a code for creating square wave of 50% duty cycle (with equal portion high and low) on the PORTB bit 5 and 25% duty cycle on PORTB bit 7. Timer0 is used to generate the time delay. (14 marks)
- Q2**
- (a) Each PIC16 instruction is a 14-bit word divided into an *opcode* and one or more *operands*. Define the meaning of *operand*. (2 marks)
- (b) Transform the statements as follow to an assembly language instruction.
- (i) decrease the content value in file address 32h by 1 and store the current value in working register. (1 mark)
 - (ii) test bit 5 in file address 48h and skip the next instruction if the particular bit is equal to 0. (1 mark)
 - (iii) complement the content value in file 56h and store the current value in file 56h itself. (1 mark)
- (c) The main program in Figure Q2(a) is scanning the first column and the first row of 3x4 keypad as shown in Figure Q2(b). If the user pressed the RB3 button, the LED will display number '1'. [Assume the button is in active HIGH].

- (i) Analyze the given program by giving a suitable comment for each instruction in *ROW1* subprogram. (10 marks)
- (ii) Compare the value in *COUNT* and *Z flag* in *ROW1* subprogram if the RB3 button is pressed with the condition if the RB3 button is not pressed. (4 marks)
- (d) The *LOOP* subprogram in Figure Q2(d) will display a running light sequence of six (6) LEDs connected to Port B. The first LED will light up for a moment before moving on to the next LED. This sequence continues until sixth (6th) LED and this cycle repeated continuously. Based on the subprogram given in Figure Q2(d), recommend a better command for bit shifting while creating a running light sequence by developing the new source code for this *LOOP* subprogram. (6 marks)
- Q3**
- (a) Name the important component in microcomputer. (2 marks)
- (b) Explain the evaluation of the Intel microprocessor architecture. (3 marks)
- (c) Demonstrate the pipelining architecture in microprocessor 8086 architecture. (8 marks)
- (d) Produce the physical address of the given offset and segment base below.
- (i) Offset = 4556H, segment base = 0345H
 - (ii) Offset = 3456H, segment base = 2367H
 - (iii) Offset = 2345H, segment base = 1000H
- (6 marks)
- (e) Construct a relationship between logical and physical address in diagram form and predict the important of shifting left four positions and filling with zeros results in the segment address. (6 marks)

Q4 (a) Choose the illegal instruction from the list and explain the reason.

- (i) MOV CX, [BX]
- (ii) MOV DX, BL
- (iii) MOV AX, BX
- (iv) MOV [BX],[BX+0004H]

(2 marks)

(b) If AL holds 100011110B and CL = 2, give the contents of AL after each of the following instruction.

- (i) SHL AL, CL
- (ii) ROR AL, CL

(3 marks)

(c) Write an instruction sequence that generates a byte-size integer in the memory location defines as RESULT. The value of the integer is to be calculated from the logic equation.

$$(\text{RESULT}) = (\text{AL}) \cdot (\text{NUM1}) + (\text{NUM2}) \cdot (\text{AL}) + (\text{BL})$$

(8 marks)

(d) Point out the contents of status flag (PF,CF,SF,ZF) in Table Q4(d) as the sequence of instructions that follows is executed. Initial content CF = 0, PF = 0, ZF = 0, SF = 0

(8 marks)

(e) The following code is an example to implement what is known as *delay loop*.

```

MOV CX, 1000H
DLY: DEC CX
NOP
JNZ DLY
NXT: --- ---
    
```

From that program,

(i) Predict how many times the JNZ delay instruction get executes.

(1 mark)

(ii) Create the program so JNZ DLY is executed 17 times.

(3 marks)

- END OF QUESTION -

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```
COLUMN1
    BSF PORTB,0
ROW1
    MOVLW 0
    BTFSC PORTB,3
    MOVLW 1
    MOVWF COUNT
    MOVF COUNT,W
    XORLW 1
    BTFSS STATUS,Z
    GOTO ROW2
D_ROW1
    MOVLW 0
    BTFSC PORTB,3
    MOVLW 1
    MOVWF COUNT
    MOVF COUNT,W
    XORLW 1
    BTFSC STATUS,Z
    GOTO D_ROW1
DISPLAY1
    MOVLW 1
    MOVWF PORTA
    GOTO COLUMN1
```

FIGURE O2(a)

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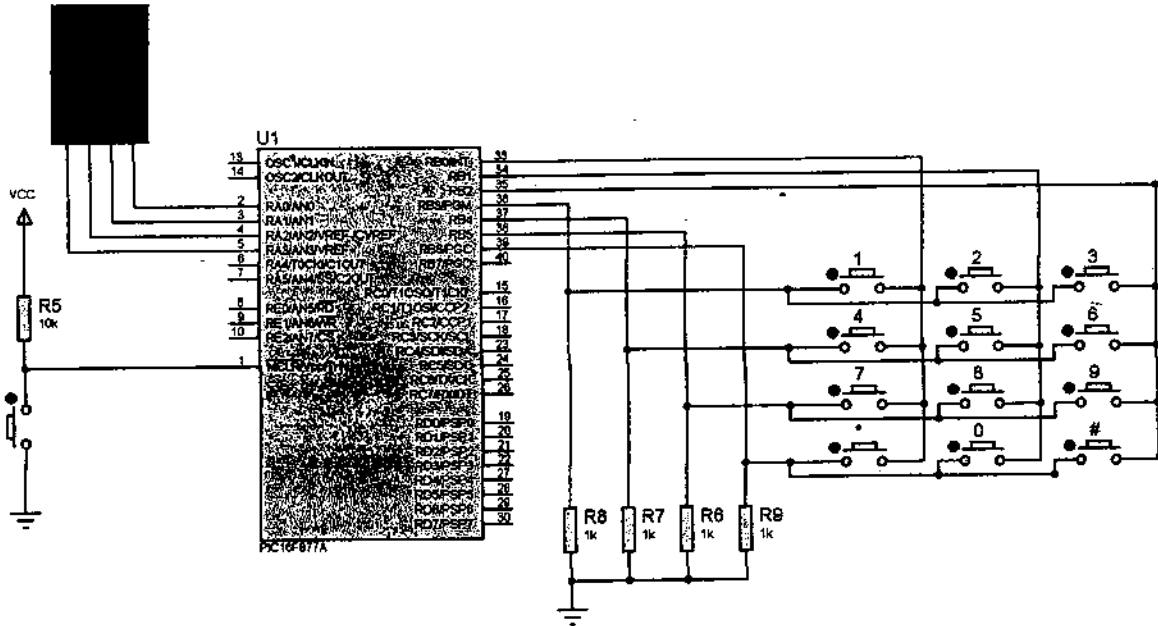


FIGURE Q2(b)

```

LOOP      MOVLW 1
          MOVWF PORTB
          CALL DELAY
          MOVLW 2
          MOVWF PORTB
          CALL DELAY
          MOVLW 4
          MOVWF PORTB
          CALL DELAY
          MOVLW 8
          MOVWF PORTB
          CALL DELAY
          MOVLW .16
          MOVWF PORTB
          CALL DELAY
          MOVLW .32
          MOVWF PORTB
          CALL DELAY
          GOTO LOOP
    
```

FIGURE Q2(d)

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TABLE Q4(d)

	Content	Instruction	Flag			
			CF	PF	ZF	SF
(i)	AL = FFH BL = 1H	ADD AL, BL				
(ii)	BX = 012AH CX = 1245H	AND BX, CX				
(iii)	AX = - 1234H BX = ABCDH	CMP AX, BX				
(iv)	CX = 14H CL = 3 ₁₆	SAR CX, CL				