YILDIZ TECHNICAL UNIVERSITY
FACULTY OF MECHANICAL ENGINEERING
DEPARTMENT OF MECHATRONICS ENGINEERING

Name :
Surname :
Id. Number :
Signature :

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MKT3811 Gr. No: 1-2 / FALL
Microprocessors and Programming

MID. TERM EXAM QUESTIONS

#1	#2	#3	#4	#5	#6	#7	#8
5	10	10	10	10	15	10	30

1. What is the function of PC (Program Counter) for a PIC 16F887? What is the content of PC?

2. What is the memory organization of PIC 16f887? Explain briefly;

3. What is the pipelining? Explain briefly;

4. What is system bus architecture of a microprocessor?

5. Compare RISC and CISC architectures in terms of their advantages and features.

otice:
Cell phones must be switched off during the exam
Calculators are not permitted
Students must obey the instructions of Research Assistants

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6. Write a program that continuesly reads the digital inputs of PORTA and writes it to PORTB.

```
LIST P=16F887
#INCLUDE <P16F887.INC>
__CONFIG          _CONFIG1,b'1110000011100001'
__CONFIG          _CONFIG2,b'1111100011111111'

.
.
.
.
.
.
.
.
.
.
.
.

END
```

7. Explain the function of the following subroutine shortly. (not line by line)

```
LIST P=16F887
#INCLUDE <P16F887.INC>
__CONFIG
_CONFIG1,b'1110000011100001'
__CONFIG
_CONFIG2,b'1111100011111111'

ORG  0x0000

...
...

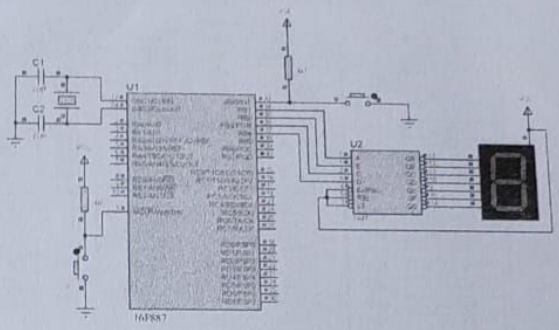
SUB
      BCF        STATUS, 6
      BCF        STATUS, 5
      MOVLW      0X20
      MOVWF      FSR
LOOP  CLRF       INDF
      INCF       FSR, F
      BTFSS      FSR, 4
      GOTO       LOOP
    RETURN
...
```

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8. A 7 – segment display is connected to PORTB of 16f887 over a 7447 BCD/ 7 – segment code converter.

In this circuit, RB0 external interrupt property with rising edge of external signal is to be used. Hence, a button is attached to pin 0 of PORTB. When there is no interrupt excitation the display is going to show "0" character, on the other hand, when interrupt is passed to µC in around 10 sec time duration "8" character is indicated over the display and then interrupt subroutine is to be ended. The assembly program representing explained process is given by following. Some lines of the program code are intentionally blanked; fill in the blanks with appropriate expressions.

Set the hexadecimal value should be assigned to the CNT_3 variable to have around 10sec delay. Write the value in the place indicated by the question marks.



7447 BCD table

Display Digit	A	B	C	D	QA	QB	QC	QD	QE	QF	QG
0	0	0	0	0	0	0	0	0	0	0	1
8	1	0	0	0	0	0	0	0	0	0	0

```
LIST P=16F887
#INCLUDE <P16F887.INC>
__CONFIG          _CONFIG1,b'1110000011100001'
__CONFIG          _CONFIG2,b'1111100011111111'
    CNT_1       EQU     h'0C'
    CNT_2       EQU     h'0D'
    CNT_3       EQU     h'0E'

    ORG   0x000
    GOTO MAIN

    ORG   0x004
    ...

 MAIN ;
    BSF STATUS,6
    BSF STATUS,5
    CLRF ANSELH
    BCF STATUS,6
    BCF STATUS,5
    ...
    ...
    ...
    ...
    ...
    ...
    ...
    ...
    ...

 LOOP
    BCF PORTB,1
    BCF PORTB,2
    BCF PORTB,3
    BCF PORTB,4
    NOP
    NOP
    GOTO LOOP

 ISR
    ...
    ...
    ...
    ...
    ...
    ...
    ...
BREAK ;
    ...
   RETFIE
```

```
DELAY_10_SEC    ;Around 10s delay soubroutine

  MOVLW       H'...'    ;??
  MOVWF       CNT_3
LOOP_10_SEC
  CALL        DELAY_250_MS
  DECFSZ      CNT_3,F
  GOTO        LOOP_10_SEC
  RETURN

DELAY_250_MS   ;Around 250ms delay soubroutine
  MOVLW       D'250'
  MOVWF       CNT_2
LOOP_250_MS
  CALL        DELAY_ONE_MS
  DECFSZ      CNT_2,F
  GOTO        LOOP_250_MS
  RETURN

DELAY_ONE_MS    ;Around 1ms delay soubroutine
  MOVLW       D'250'
  MOVWF       CNT_1
LOOP_ONE_MS
  NOP
  DECFSZ      CNT_1,F
  GOTO        LOOP_ONE_MS
  RETURN
  ...
```

Select proper expression for the blanks;

BCF PORTB,4	BCF INTCON,1
END	BCF PORTB,3
CLRF PORTB	MOVWF TRISB
BCF STATUS,6	CALL DELAY_10_SEC
BSF INTCON,4	BSF INTCON,7
MOVLW b'00000001'	BSF PORTB,1
BTFSS INTCON,1	GOTO LOOP
GOTO BREAK	BSF STATUS,5
BCF PORTB,2	GOTO ISR
	BCF STATUS,5

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