قائمة الاسئلة

الانظمة المدمجة والواجهات- كلية الهندسة - قسم الطبية الحيوية - المستوى الرابع- 3ساعات - درجة هذا الاختبار (50)

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1) One of the Embedded System's Applications is:
   1) - used for Computational
   2) - used for General purposes
   3) + smart home
   4) - All of these
2) Most instructions of the PIC16F microcontrollers are executed in:
   1) + one instruction cycle
   2) - two instruction cycles
   3) - four instruction cycle
   4) - eight instruction cycle
3) CISC architecture is characterized by:
   1) - the usage of large number of registers and limited access to Memory
   2) - Fixed Instruction & Registers size
   3) - all of these
   4) + none of these
4) All the PIC16 movement instructions doesn't change _____ except the _____ instruction.
   1) - stack; RAM
   2) + Zero Flag; MOVF
   3) - any Flag; MOVF
   4) - stack; call
5) The greatest number of the nested call instructions with PIC16F873 is _____.
   1) - 1
   2) - 2
   3) + 8
   4) - 10
6) The EEPROM is used for:
   1) - Storing temporary data
   2) - hosting the driving program only
   3) - hosting the driving program & some of data variables like lookup
   4) + storing of permanent data
7) An interrupt of any timers can be used in wake-up the PIC16F873-MC from sleep mode.
   1) - TRUE.
   2) + FALSE.
8) The PIC16F84-MC's Timer2 has an internal register of 8-bit:
   1) - TRUE.
   2) + FALSE.
9) It's TRUE. that any external interrupt can wake up the microcontroller from sleep mode:
   1) + TRUE.
   2) - FALSE.
10) The PWM mode, is the most important and the only unique mode of CCP module:
   1) - TRUE.
   2) + FALSE.
11)

ملاحظة: يزود الطلاب بنسخ للمتطلبات المدرجة في الأوراق التالية

Best Wishes

This List of Configuration Registers and Block diagrams are allowed to be given to the students

SFRs bank 0

Address	Name	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
00h	INDF	Indirect register							
01h	TMR0	Timer T0 Register							
02h	PCL	Least Significant Byte of Program Counter							
03h	STATUS	IRP	RP1	RP0	TO	PD	Z	DC	C
04h	FSR	Indirect Data Memory Address Pointer							
05h	PORTA	RA7	RA6	RA5	RA4	RA3	RA2	RA1	RA0
06h	PORTB	RB7	RB6	RB5	RB4	RB3	RB2	RB1	RB0
07h	PORTC	RC7	RC6	RC5	RC4	RC3	RC2	RC1	RC0
08h	PORTD	RD7	RD6	RD5	RD4	RD3	RD2	RD1	RD0
09h	PORTE	-	-	-	-	RE3	RE2	RE1	RE0
0Ah	PCLATH	-	-	-	Upper 5 bits of Program Counter				
0Bh	INTCON	GIE	PEIE	T0IE	INTE	RBIE	T0IF	INTF	RBIF
0Ch	PIR1	-	ADIF	RCIF	TXIF	SSPIF	CCP1IF	TMR2IF	TMR1IF
0Dh	PIR2	OSFIF	C2IF	C1IF	EEIF	BCLIF	ULPWUIF	-	CCP2IF
0Eh	TMR1L	Least Significant Byte of the 16-bit Timer TMR0							
0Fh	TMR1H	Most Significant Byte of the 16-bit Timer TMR0							
10h	T1CON	T1GINV	TMR1GE	T1CKPS1	T1CKPS0	T1OSCEN	T1SYNC	TMR1CS	TMR1ON
11h	TMR2	Timer T2 Register							
12h	T2CON	-	TOUTPS3	TOUTPS2	TOUTPS1	TOUTPS0	TMR2ON	T2CKPS1	T2CKPS0
13h	SSPBUF	Synchronous Serial Port Receive Buffer/Transmit Register							
14h	SSPCON	WCOL	SSPOV	SSPEN	CKP	SSPM3	SSPM2	SSPM1	SSPM0
15h	CCPR1L	Capture/ComparePWM Register 1 Low Byte (LSB)							
16h	CCPR1H	Capture/ComparePWM Register 1 High Byte (LSB)							
17h	CCP1CON	P1M1	P1M0	DC1B1	DC1B0	CCP1M3	CCP1M2	CCP1M1	CCP1M0
18h	RCSTA	SPEN	RX9	SREN	CREN	ADDEN	FERR	OERR	RX9D
19h	TXREG	EUSART Transmit Data Register							
1Ah	RCREG	EUSART Receive Data Register							
1Bh	CCPR2L	Capture/Compare PWM Register 1 Low Byte (LSB)							
1Ch	CCPR2H	Capture/Compare PWM Register 1 High Byte (LSB)							
1Dh	CCP2CON	-	-	DC2B1	DC2B0	CCP2M3	CCP2M2	CCP2M1	CCP2M0
1Eh	ADRESH	A/D Result Register High Byte							
1Fh	ADCON0	ADCS1	ADCS0	CHS3	CHS2	CHS1	CHS0	GO/DONE	ADON

SFRs bank 1

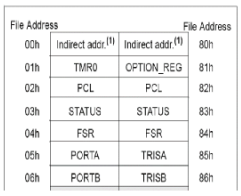
Address	Name	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
80h	INDF	Indirect Register							
81h	OPTION_REG	RBPU	INTEDG	T0CS	T0SE	PSA	PS2	PS1	PS0
82h	PCL	Least Significant Byte of Program Counter							
83h	STATUS	IRP	RP1	RP0	TO	PD	Z	DC	C
84h	FSR	Indirect Data Memory Address Pointer							
85h	TRISA	TRISA7	TRISA6	TRISA5	TRISA4	TRISA3	TRISA2	TRISA1	TRISA0
86h	TRISB	TRISB7	TRISB6	TRISB5	TRISB4	TRISB3	TRISB2	TRISB1	TRISB0
87h	TRISC	TRISC7	TRISC6	TRISC5	TRISC4	TRISC3	TRISC2	TRISC1	TRISC0
88h	TRISD	TRISD7	TRISD6	TRISD5	TRISD4	TRISD3	TRISD2	TRISD1	TRISD0
89h	TRISE	-	-	-	-	TRISE3	TRISE2	TRISE1	TRISE0
8Ah	PCLATH	-	-	-	Upper 5 bits of the Ptogram Counter				
8Bh	INTCON	GIE	PEIE	T0IE	INTE	RBIE	T0IF	INTF	RBIF
8Ch	PIE1	-	ADIE	RCIE	TXIE	SSPIE	CCP1IE	TMR2IE	TMR1IE
8Dh	PIE2	OSFIE	C2IE	C1IE	EEIE	BCLIE	ULPWUIE	-	CCP2IE
8Eh	PCON	-	-	ULPWUE	SBOREN	-	-	POR	BOR
8Fh	OSCCON	-	IRCF2	IRCF1	IRCF0	OSTS	HTS	LTS	SCS
90h	OSCTUNE	-	-	-	TUN4	TUN3	TUN2	TUN1	TUN0
91h	SSPCON2	GCEN	ACKSTAT	ACKDT	ACKEN	RCEN	PEN	RSEN	SEN
92h	PR2	Timer T2 Period Register							
93h	SSPADD	Synchronous Serial Port (I²C mode) Address Register							
93h	SSPMSK	MSK7	MSK6	MSK5	MSK4	MSK3	MSK2	MSK1	MSK0
94h	SSPSTAT	SMP	CKE	D/A	P	S	R/W	UA	BF
95h	WPUB	WPUB7	WPUB6	WPUB5	WPUB4	WPUB3	WPUB2	WPUB1	WPUB0
96h	IOCB	IOCB7	IOCB6	IOCB5	IOCB4	IOCB3	IOCB2	IOCB1	IOCB0
97h	VRCON	VREN	VROE	VRR	VRSS	VR3	VR2	VR1	VR0
98h	TXSTA	CSRC	TX9	TXEN	SYNC	SENDB	BRGH	TRMT	TX9D
99h	SPBRG	BRG7	BRG6	BRG5	BRG4	BRG3	BRG2	BRG1	BRG0
9Ah	SPBRGH	BRG15	BRG14	BRG13	BRG12	BRG11	BRG10	BRG9	BRG8
9Bh	PWM1CON	PRSEN	PDC6	PDC5	PDC4	PDC3	PDC2	PDC1	PDC0
9Ch	ECCPAS	ECCPASE	ECCPAS2	ECCPAS1	ECCPAS0	PSSAC1	PSSAC0	PSSBD1	PSSBD0
9Dh	PSTRCON	-	-	-	STRSYNC	STRD	STRC	STRB	STRA
9Eh	ADRESL	A/D Result Register Low Byte							
9Fh	ADCON1	ADFM	-	VCFG1	VCFG0	-	-	-	-

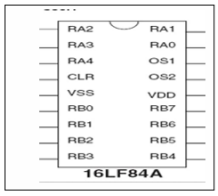
SFRs bank 2

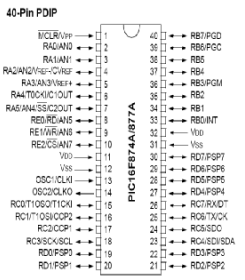
Address	Name	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
100h	INDF	Indirect register							
101h	TMR0	Timer T0 Register							
102h	PCL	Least Significan Byte of the Program Counter							
103h	STATUS	IRP	RP1	RP0	TO	PD	Z	DC	C
104h	FSR	Indirect Data Memory Address Pointer							
105h	WDTCON	-	-	-	WDTPS3	WDTPS2	WDTPS1	WDTPS0	SWDTEN
106h	PORTB	RB7	RB6	RB5	RB4	RB3	RB2	RB1	RB0
107h	CM1CON0	C1ON	C1OUT	C1OE	C1POL	-	C1R	C1CH1	C1CH0
108h	CM2CON0	C2ON	C2OUT	C2OE	C2POL	-	C2R	C2CH1	C2CH0
109h	CM2CON1	MC1OUT	MC2OUT	C1RSEL	C2RSEL	-	-	T1GSS	C2SYNC
10Ah	PCLATH	-	-	-	Upper 5 bits of the Program Counter				
10Bh	INTCON	GIE	PEIE	T0IE	INTE	RBIE	T0IF	INTF	RBIF
10Ch	EEDAT	EEDAT7	EEDAT6	EEDAT5	EED AT4	EEDAT3	EEDAT2	EEDAT1	EEDAT0
10Dh	EEADR	EEADR7	EEADR6	EEADR5	EEADR4	EEADR3	EEADR2	EEADR1	EEADR0
10Eh	EEDATH	-	-	EEDATH5	EEDATH1	EEDAT+3	EEDATH2	EEDATH1	EEDATH0
10Fh	EEADRH	-	-	-	EEADRH4	EEADRH3	EEADRH2	EEADRH1	EEADRH0

SFRs bank 3

Address	Name	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
180h	INDF	Indirect Register							
181h	OPTION_REG	RBPU	INTEDG	T0CS	T0SE	PSA	PS2	PS1	PS0
182h	PCL	Least Significan Byte of the Program Counter							
183h	STATUS	IRP	RP1	RP0	TO	PD	Z	DC	C
184h	FSR	Indirect Data Memory Address Pointer							
185h	SRCON	SR1	SR0	C1SEN	C2REN	PULSS	PULSR	-	FVREN
186h	TRISB	TRISB7	TRISB6	TRISB5	TRISB4	TRISB3	TRISB2	TRISB1	TRISB0
187h	BAUDCTL	ABDOVF	RCIDL	-	SCKP	BRG16	-	WUE	ABDEN
188h	ANSEL	ANS7	ANS6	ANS5	ANS4	ANS3	ANS2	ANS1	ANS0
189h	ANSELH	-	-	ANS13	ANS12	ANS11	ANS10	ANS9	ANS8
19Ah	PCLATH	-	-	-	Upper 5 bits of the Program Counter				
19Bh	INTCON	GIE	PEIE	T0IE	INTE	RBIE	T0IF	INTF	RBIF
19Ch	EECON1	EEPGD	-	-	-	WRERR	WREN	WR	RD
19Dh	EECON2	EEPROM Control Register 2							







0000 = Capture/Compare/PWM disabled (resets CCPx module)
0100 = Capture mode, every falling edge
0101 = Capture mode, every rising edge
0110 = Capture mode, every 4th rising edge
0111 = Capture mode, every 16th rising edge
1000 = Compare mode, set output on match (CCPxIF bit is set)
1001 = Compare mode, clear output on match (CCPxIF bit is set)
1010 = Compare mode, generate software interrupt on match (CCPxIF bit is set, CCPx pin is unaffected)
1011 = Compare mode, trigger special event (CCPxIF bit is set, CCPx pin is unaffected); CCP1 resets TMR1; CCP2 resets TMR1 and starts an A/D conversion (if A/D module is enabled)
11xx = PWM mode

CCPx Mode Select bit

The slowest clock tick interrupt rate, which can be generated using Timer1, when the PIC16F873 MC is

operated with oscillator frequency of 800 kHz, is:

1) - 0.3814 kHz
2) - 381.4 kHz
3) + 0.3814 Hz
4) - 3.814 kHz

12) The fastest clock tick interrupt rate, which can be generated using Timer0 when PIC16F877 MC is operated with oscillator frequency of 800 kHz, is:
1) - 800 kHz
2) - 200 Hz
3) - 200/256 kHz
4) + 200 kHz

13) The slowest interrupt frequency, which can be made using Timer2, when PIC16F877 is operated with oscillator frequency of 4 MHz, could be generated when the PR2 register is set to:
1) - 1
2) - 256
3) - 0
4) + 255

14) In order to employ Timer0 in counter mode for counting up to 32000 events, you can configure its pre-scaler for _____ and set its internal register to _____.
1) - 256; 125
2) - 128; 250
3) - 128; 255
4) + all of these

15) Timer2 module of the PIC16F877-MC couldn't generate an interrupt, when it is in a sleep mode.
1) + TRUE.
2) - FALSE.

16) The Assembly instruction, MOVF 583, may affects the status register's zero flag.
1) - TRUE.
2) + FALSE.

17) The Assembly instruction, MOVF Cntr, will affect (may change) the logic value of at most one bit in the status register.
1) + TRUE.
2) - FALSE.

18) The new value of the work-reg, after executing the Assembly instruction: ANDLW 0xFA; Assuming previous Work-reg's value was 0x90; is:
1) - FA H
2) - F0 H
3) + 90 H
4) - 9A H

19)
```
|Study the following assembly code (program) for driving a Derbot with 2-motors
    (Left & Right):
; Initialization & set up of PWM
    movlw B'00000100'
    movwf t2con
    movlw B'00001100'
    movwf ccp1con
    movwf ccp2con
    movlw 0f9
    movwf pr2
Main ; Main Procedure (Subroutine) Start Point
LB1
call Leftmot1
call Rightmot1
call Delay_Sub      ; Assume this subroutine generates a delay time of 1-minute
call Leftmot2
call Rightmot2
call Delay_Sub      ; Assume this subroutine generates a delay time of 1-minute
GOTO LB1
; .....
Leftmot1
    bsf  porta,mot_en_left ; L293D Left H-bridge Enable bit
    movlw D'176'
    movwf CCPR2L
    return
Leftmot2
    bsf  porta,mot_en_left ; L293D Left H-bridge Enable bit
    movlw D'74'
    movwf CCPR2L
    return
    bsf  porta,mot_en_left ; L293D Left H-bridge Enable bit
    movlw D'74'
    movwf CCPR1L
    return
Rightmot1
    bsf  porta,mot_en_right      ; L293D Right H-bridge Enable bit
    movlw D'176'
    movwf CCPR1L
    return
Rightmot2
    bsf  porta,mot_en_right      ; L293D Right H-bridge Enable bit
    movlw D'74'
    movwf CCPR1L
    return
According to this driving program, the Derbot will move 1-minute to right and 1-minute to left and this
    process is repeated continuously.
```

1) - TRUE.
2) + FALSE.

20)

```
Again, study the following assembly code (program) for driving a Derbot with 2-motors (Left & Right):
; Initiallization & set up of PWM
    movlw B'00000100'
    movwf t2con
    movlw B'00001100'
    movwf ccp1con
    movwf ccp2con
    movlw 0f9
    movwf pr2
Main ; Main Procedure (Subroutine) Start Point
LB1
call Leftmot1
call Rightmot1
call Delay_Sub     ; Assume this subroutine generates a delay time of 1-minute
call Leftmot2
call Rightmot2
call Delay_Sub     ; Assume this subroutine generates a delay time of 1-minute
GOTO LB1
; .........
Leftmot1
    bsf  porta,mot_en_left ; L293D Left H-bridge Enable bit
    movlw D'176'
    movwf CCPR2L
    return
Leftmot2
    bsf  porta,mot_en_left ; L293D Left H-bridge Enable bit
    movlw D'74'
    movwf CCPR2L
    return
Rightmot1
    bsf  porta,mot_en_right     ; L293D Right H-bridge Enable bit
    movlw D'176'
    movwf CCPR1L
    return
Rightmot2
    bsf  porta,mot_en_right     ; L293D Right H-bridge Enable bit
    movlw D'74'
    movwf CCPR1L
    return
According to this driving program, the Derbot will move 1-minute to right and 1-minute to left and this process is repeated continuously until battery energy is decreased below the threshold level.
```

1) - TRUE.
2) + FALSE.

21)

```
Again, study the following assembly code (program) for driving a Derbot with 2-motors (Left & Right):
; Initiallization & set up of PWM
        movlw B'00000100'
        movwf t2con
        movlw B'00001100'
        movwf ccp1con
        movwf ccp2con
        movlw 0f9
        movwf pr2
Main  ; Main Procedure (Subroutine) Start Point
LB1
call Leftmot1
call Rightmot1
call Delay_Sub    ; Assume this subroutine generates a delay time of 1-minute
call Leftmot2
call Rightmot2
call Delay_Sub    ; Assume this subroutine generates a delay time of 1-minute
GOTO LB1
; .........
Leftmot1
        bsf  porta, mot_en_left    ; L293D Left H-bridge Enable bit
        movlw D'176'
        movwf CCPR2L
        return
Leftmot2
        bsf  porta,mot_en_left     ; L293D Left H-bridge Enable bit
        movlw D'74'
        movwf CCPR2L
        return
Rightmot1
        bsf  porta, mot_en_right  ; L293D Right H-bridge Enable bit
        movlw D'176'
        movwf CCPR1L
        return
Rightmot2
        bsf  porta,mot_en_ right  ; L293D Right H-bridge Enable bit
        movlw D'74'
        movwf CCPR1L
        return
According to this program, neglect any other design considerations, movement of the 2-motor in forward and backward are _____ in speed with reverse directions:
```

1) - Different
2) - Exactly Equal
3) + Different &Exactly Equal
4) - None of these

22)

```
Again, study the following assembly code (program) for driving a Derbot with 2-motors (Left & Right):
; Initiallization & set up of PWM
        movlw B'00000100'
        movwf t2con
        movlw B'00001100'
        movwf ccp1con
        movwf ccp2con
        movlw 0f9
        movwf pr2
Main  ; Main Procedure (Subroutine) Start Point
LB1
call Leftmot1
call Rightmot1
call Delay_Sub  ; Assume this subroutine generates a delay time of 1-minute
call Leftmot2
call Rightmot2
call Delay_Sub  ; Assume this subroutine generates a delay time of 1-minute
GOTO LB1
; .........
Leftmot1
        bsf  porta, mot_en_left  ; L293D Left H-bridge Enable bit
        movlw D'176'
        movwf CCPR2L
        return
Leftmot2
        bsf  porta,mot_en_left  ; L293D Left H-bridge Enable bit
        movlw D'74'
        movwf CCPR2L
        return
Rightmot1
        bsf  porta, mot_en_right ; L293D Right H-bridge Enable bit
        movlw D'176'
        movwf CCPR1L
        return
Rightmot2
        bsf  porta,mot_en_ right ; L293D Right H-bridge Enable bit
        movlw D'74'
        movwf CCPR1L
        return
According to this program, neglect any other design considerations, and after 8-minutes the Derbot Position is at:
_____
```

1) - The Destined/Designed Point
2) + The Origin Start Point
3) - The Middle point between the Start & the Designed Points
4) - None of the previous answers

23)

```
Again, study the following assembly code (program) for
driving a Derbot with 2-motors (Left & Right):
; Initiallization & set up of PWM
        movlw B'00000100'
        movwf t2con
        movlw B'00001100'
        movwf ccp1con
        movwf ccp2con
        movlw 0f9
        movwf pr2
Main  ; Main Procedure (Subroutine) Start Point
LB1
call Leftmot1
call Rightmot1
call Delay_Sub  ; Assume this subroutine generates a delay
time of 1-minute
call Leftmot2
call Rightmot2
call Delay_Sub  ; Assume this subroutine generates a delay
time of 1-minute
GOTO LB1
; .........
Leftmot1
        bsf  porta, mot_en_left   ;  L293D  Left  H-bridge
Enable bit
        movlw D'176'
        movwf CCPR2L
        return
Leftmot2
        bsf  porta,mot_en_left   ;  L293D  Left  H-bridge
Enable bit
        movlw D'74'
        movwf CCPR2L
        return
Rightmot1
        bsf  porta, mot_en_right ;  L293D  Right H-bridge
Enable bit
        movlw D'176'
        movwf CCPR1L
        return
Rightmot2
        bsf  porta,mot_en_ right ;  L293D  Right H-bridge
Enable bit
        movlw D'74'
        movwf CCPR1L
        return
According to this program, neglect any other design
considerations, and after 5-minutes the Derbot Position is at:
```

1) - The Origin Start Point
2) + The Destined/Designed Point
3) - The Middle point between the Start & the Designed Points
4) - None of the previous answers

24)

```
Again, study the following assembly code (program) for
driving a Derbot with 2-motors (Left & Right) with bit little
modification in main proc:
; Initiallization & set up of PWM
        movlw B'00000100'
        movwf t2con
        movlw B'00001100'
        movwf ccp1con
        movwf ccp2con
        movlw 0f9
        movwf pr2
Main  ; Main Procedure (Subroutine) Start Point
LB1
call Leftmot1
call Rightmot1
call Delay_Sub  ; Assume this subroutine generates a delay
time of 1-minute
call Leftmot1
bcf  porta, mot_en_right ; L293D Right H-bridge Enable bit
; Assume the following subroutine generates a delay time of (4
sec) enough for 90° Rotation
call Delay_Sub2
GOTO LB1
; .........
Leftmot1
        bsf  porta, mot_en_left   ;  L293D  Left  H-bridge
Enable bit
        movlw D'176'
        movwf CCPR2L
        return
Leftmot2
        bsf  porta,mot_en_left   ;  L293D  Left  H-bridge
Enable bit
        movlw D'74'
        movwf CCPR2L
        return
Rightmot1
        bsf  porta, mot_en_right ;  L293D  Right H-bridge
Enable bit
        movlw D'176'
        movwf CCPR1L
        return
Rightmot2
        bsf  porta,mot_en_ right ;  L293D  Right H-bridge
Enable bit
        movlw D'74'
        movwf CCPR1L
        return
According to this program situation, neglect any other design
considerations, the Derbot is drived in:
```

1) - A circular fashion starting from and passing through the Starting Point
2) - A spherical fashion starting from and passing through the Starting Point
3) + A Squaral round starting from and passing through the Starting Point
4) - A Rectangular way starting from and passing through the Starting Point

25)

```
Again, study the following assembly code (program) for
driving a Derbot with 2-motors (Left & Right) with bit little
modification in main proc:
; Initiallization & set up of PWM
        movlw B'00000100'
        movwf t2con
        movlw B'00001100'
        movwf ccp1con
        movwf ccp2con
        movlw 0f9
        movwf pr2
Main  ; Main Procedure (Subroutine) Start Point
LB1
call Leftmot1
call Rightmot1
call Delay_Sub  ; Assume this subroutine generates a delay
time of 1-minute
call Leftmot1
bcf  porta, mot_en_right ; L293D Right H-bridge Enable bit
; Assume the following subroutine generates a delay time of (4
sec) enough for 90° Rotation
call Delay_Sub2
GOTO LB1
; .........
Leftmot1
        bsf  porta, mot_en_left   ;  L293D  Left  H-bridge
Enable bit
        movlw D'176'
        movwf CCPR2L
        return
Leftmot2
        bsf  porta,mot_en_left   ;  L293D  Left  H-bridge
Enable bit
        movlw D'74'
        movwf CCPR2L
        return
Rightmot1
        bsf  porta, mot_en_right          ; L293D Right H-
bridge Enable bit
        movlw D'176'
        movwf CCPR1L
        return
Rightmot2
        bsf  porta,mot_en_right; L293D  Right H-bridge
Enable bit
        movlw D'74'
        movwf CCPR1L
        return
According to this program, neglect any other design
considerations, and at first-time execution of the GOTO
LB1 instruction, the Derbot Position is at:
```

1) + The initial point of the second side of the Squaral round
2) - The initial point of the second quarter arc of the Spherical round
3) - The initial point of the second side (assume width) of the rectangular round

4) - The initial point of the second quarter arc of the circular round

26)

```
Again, study the following assembly code (program) for driving a Derbot with 2-motors (Left & Right) with bit little modification in main proc:
; Initialization & set up of PWM
        movlw B'00000100'
        movwf t2con
        movlw B'00001100'
        movwf ccp1con
        movwf ccp2con
        movlw 0f9
        movwf pr2
Main ; Main Procedure (Subroutine) Start Point
LB1
call Leftmot1
call Rightmot1
call Delay_Sub  ; Assume this subroutine generates a delay time of 1-minute
call Leftmot1
bcf porta, mot_en_right ; L293D Right H-bridge Enable bit
; Assume the following subroutine generates a delay time of (4 sec) enough for 90° Rotation
call Delay_Sub2
GOTO LB1
; .....
Leftmot1
        bsf porta, mot_en_left  ; L293D Left H-bridge Enable bit
        movlw D'176'
        movwf CCPR2L
        return
Leftmot2
        bsf porta,mot_en_left  ; L293D Left H-bridge Enable bit
        movlw D'74'
        movwf CCPR2L
        return
Rightmot1
        bsf porta, mot_en_right        ; L293D Right H-bridge Enable bit
        movlw D'176'
        movwf CCPR1L
        return
Rightmot2
        bsf porta,mot_en_right; L293D Right H-bridge Enable bit
        movlw D'74'
        movwf CCPR1L
        return
According to this program, neglect any other design considerations, the Derbot will back visit or reach (first touch) to its starting point after:
```

1) - 4 minutes
2) - 4 minutes and 16 seconds
3) + 4 minutes and 12 seconds
4) - Will not exactly back or pass throughout its original/starting point

27) According to the usage of the CCP module in PWM mode for Digital-to-Analog (DA conversion, an external _____ is needed.

1) + RC Filter circuit.
2) - Low-pass RC Filter circuit followed by bandpass filter.
3) - High-pass RC Filter circuit followed by bandpass filter.
4) - Band-pass RC Filter circuit followed by bandpass filter.

28) A Microcontroller like PIC16F84 which is without CCP on-chip module couldn't be used for generating a digital waveform.

1) - TRUE.
2) + FALSE.

29) A square waveform with 75% duty cycle which is generated using the CCP module in PWM mode, can drive a motor with:

1) - some +ve average current, enough to drive a motor in reverse direction
2) - some +ve average current but, it doesn't enough to drive a motor
3) - a zero average current which stops the movement of a motor
4) + some +ve average current, enough to drive a motor in forward direction

30)

```
Read and study the following assembly code for generating a software delay time.
    Assume a PIC16F873-MC operated with oscillator frequency of 4 MHz.
SwDly
    movlw 0f9          ; 0f9 is a Hexadecimal value
    movwf delcntr1
del
    nop                ;1 T
    nop                ;1 T
    nop                ;1 T
    nop                ;1 T
    nop                ;1 T
    nop                ;1 T
    nop                ;1 T
    nop                ;1 T
    nop                ;1 T
    nop                ;1 T
    nop                ;1 T
    nop                ;1 T
    nop                ;1 T
    nop                ;1 T
    nop                ;1 T
    nop                ;1 T
    nop                ;1 T
    nop                ;1 T
    decfsz delcntr1,1  ;1 T
    goto  del1         ;2 T
    return
According to the above subroutine, assume there is another subroutine, let's name it OuterSub, which is used to invoke/call the SwDly subroutine using a loop with 200-repitions. Hence, the approximately generated delay time after OuterSub subroutine execution is equal to:
```

1) - 1 minute
2) - 10 minutes
3) - 100 minutes

4) + 1 second

31) **Read and study the following assembly code for generating a software delay time. Assume a PIC16F873-MC operated with oscillator frequency of *4 MHz*.**

```
SwDly
    movlw  0f9          ; 0f9 is a Hexadecimal value
    movwf  delcntr1
del
    nop                 ;1T
    nop                 ;1T
    nop                 ;1T
    nop                 ;1T
    nop                 ;1T
    nop                 ;1T
    nop                 ;1T
    nop                 ;1T
    nop                 ;1T
    nop                 ;1T
    nop                 ;1T
    nop                 ;1T
    nop                 ;1T
    nop                 ;1T
    nop                 ;1T
    nop                 ;1T
    nop                 ;1T
    nop                 ;1T
    decfsz delcntr1,1   ;1T
    goto   del1         ;2T
    return
```

According to the above subroutine, assume there is another subroutine, let's name it OuterSub, which is used to invoke/call the SwDly subroutine using a loop with 200-repitions. Hence, how many calls are required from a third subroutine, named OuterSub2, to the OuterSub for generating a delay time of 4 minutes?

1) - Approximately 1 call, which generates 3 minutes and 20 seconds
2) + 240 calls
3) - Doesn't possible since the OuterSub is generating more than 4 minutes in 1-call
4) - 4 calls

32) **Read and study the following lookup subroutine:**

```
;   A lookup Subroutine named LkTbl
LkTbl
        addwfpcl
          retlw 23
          retlw 3f
          retlw 47
          retlw 7f
          retlw a2
          retlw 1f
          retlw 03
          retlw 67
```

According to the above subroutine, what are the work register's output values when the input values given by caller subroutine are: 0, 4, and 8 in one-to-one? *Note that: The NaN Symbol means Unknown value.*

a) NaN; a2; 67
b) 23; 4; NaN
c) 23; a2; NaN
d) None of these answers

1) - a
2) - b
3) + c
4) - d

33) The most basic non-volatile memory, is:

1) + ROM
2) - PROM
3) - EPROM
4) - Flash memory

34) Which one of the following memories has better speed in accessing data?

1) - DRAM
2) - ROM or EEPROM
3) - Flash ROM
4) + SRAM

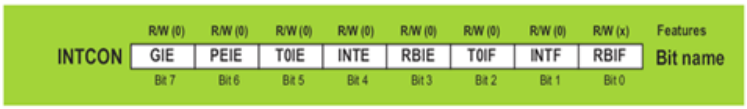
35) which one of the following is not a signal impairment:

1) - thermal noise
2) - interference
3) + miss reading of an event
4) - none of the above

36) Which of the following is used as an input device in embedded systems?

1) - LCD
2) - parallel port
3) - Serial port
4) + Motion Sensor

37) **At instance time while the program is executing. It is noticed that the *INTCON* register's value is B8H. Which type of interrupt(s) is (are) enabled?**



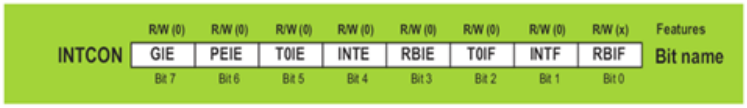
1) - No one interrupt is enabled
2) - Global Interrupt Enable bit only
3) + Timer0, External, and Port-B on-change interrupts
4) - All available interrupts are enabled

38) **During the work of the microcontroller, an interrupt is occurred, and the *INTCON* register's value is changed from *F8H* to *FAH*. Which interrupt source flag bit has been so-triggered?**

a) No one interrupt Flag bit is triggered
b) External Interrupt
c) Port-B on change Interrupt
d) Answers in (b) & (c)

1) - a
2) + b
3) - c
4) - d

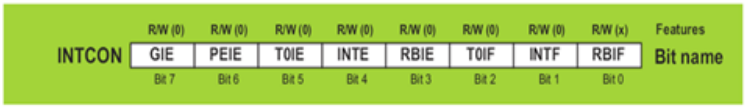
39) **During the work of the microcontroller, an interrupt Service routine is now to be invoked & executed, and the *INTCON* register's value is found with *FBH* value. Which interrupt type is the source of next invocation, since the external interrupt service routine is in executing of its previous instruction of the its last instruction?**



1) - The External Interrupt
2) - Both the Port-B on change & the External Interrupt
3) - Timer0 Interrupt
4) + The Port-B on change Interrupt

40)

An interrupt Service routine is now in execution, and the *INTCON* register's has *F8H* value. Which interrupt type is the source?



1) - No Interrupt is happened
2) - The Port-B on change or the External Interrupt
3) - The Port-B on change, the External Interrupt or the Timer0 Interrupt
4) + The EEPROM interrupt