POLITEKNIK
MALAYSIA

BAHAGIAN PEPERIKSAAN DAN PENILAIAN
JABATAN PENDIDIKAN POLITEKNIK
KEMENTERIAN PENDIDIKAN TINGGI

JABATAN KEJURUTERAAN ELEKTRIK

PEPERIKSAAN AKHIR

SESI DISEMBER 2016

EC501 : EMBEDDED SYSTEM APPLICATIONS

TARIKH : 08 APRIL 2017
MASA : 8.30 AM – 10.30 AM (2 JAM)

Kertas ini mengandungi **SEPULUH (10)** halaman bercetak.

Bahagian A: Struktur (10 soalan)
Bahagian B: Esei (3 soalan)

Dokumen sokongan yang disertakan : Tiada

JANGAN BUKA KERTAS SOALAN INI SEHINGGA DIARAHKAN

(CLO yang tertera hanya sebagai rujukan)

SECTION A: 40 MARKS

BAHAGIAN A: 40 MARKAH

INSTRUCTION:

This section consists of **TEN (10)** structured questions. Answer **ALL** questions.

ARAHAN:

*Bahagian ini mengandungi **SEPULUH (10)** soalan berstruktur. Jawab **SEMUA** soalan.*

QUESTION 1

CLO1
C1

List **TWO (2)** advantages and **TWO (2)** disadvantages of a microcontroller.

SOALAN 1

*Senaraikan **DUA (2)** kelebihan dan **DUA (2)** kekurangan pengawal mikro.*

[4 marks]

[*4 markah*]

QUESTION 2

CLO1
C1

What does the term "Embedded System" mean and give **TWO (2)** examples of embedded system applications?

SOALAN 2

*Apakah maksud "Sistem Terbenam" dan berikan **DUA (2)** contoh aplikasi yang melibatkan system terbenam?*

[4 marks]

[*4 markah*]

QUESTION 3

CLO1
C1

What is the difference between the MOVWF and MOVF instructions?

SOALAN 3

Apakah perbezaan di antara arahan MOVWF and MOVF?

[4 marks]

[*4 markah*]

QUESTION 4

CLO1
C3

Show the status of C, DC, and Z flags after the addition of 9CH and 64H in the following instructions:

SOALAN 4

Tunjukkan status bendera C, DC, dan Z selepas penambahan 9CH dan 64H di dalam arahan berikut:

MOVLW 9CH

ADDLW 64H

[4 marks]

[*4 markah*]

QUESTION 5

CLO1
C2

Using C program, write instruction to set PORTD as input and PORTB as output.

SOALAN 5

Menggunakan program C, tulis arahan untuk menjadikan PORTD sebagai input dan PORTB sebagai output.

[4 marks]

[*4 markah*]

QUESTION 6

CLO1
C3

Show how to configure a TRIS register in an Assembly Language to make the PORTB as an input and PORTC as an OUTPUT.

SOALAN 6

Tunjukkan bagaimana untuk menetapkan daftar TRIS di dalam Bahasa Himpunan untuk menjadikan PORTB sebagai input dan PORTC sebagai output.

[4 marks]

[*4 markah*]

QUESTION 7

CLO1
C2

Explain instructions below:

SOALAN 7

Jelaskan arahan di bawah:

i.   LATC = 0;

ii.   PORTD = 0xFF;

iii.   TRISB = 0xF0;

[4 marks]

[*4 markah*]

CLO1
C2

QUESTION 8

Relay is an electrically controllable switch widely used in industrial control, automation and appliances. Sketch a symbol for **TWO (2)** types of relay:

    i.   Double pole double throw (DPDT),

    ii.   Single pole double throw (SPDT).

SOALAN 8

*Geganti merupakan suis kawalan elektrik yang biasa digunakan dalam kawalan industri, automasi dan perkakas. Lukis simbol bagi **DUA (2)** jenis geganti di bawah:*

    i.   *Dua kutub dua arah (DPDT),*

    ii.   *Kutub tunggal dua arah (SPDT).*

[4 marks]

[*4 markah*]

QUESTION 9

"A DC motor works by converting electrical power into mechanical work. It forces current through a coil and produces a magnetic field to spin the motor. The direction of the shaft rotation depends on the direction of the current flows. Rotation of DC motor can control using motor driver."

CLO1
C1

Based on statement above, list **TWO (2)** types of DC motor and **TWO (2)** examples of motor driver.

SOALAN 9

"Motor AT berfungsi dengan menukarkan tenaga elektrik kepada tenaga mekanikal. Ia menolak arus melalui gegelung dan menghasilkan daya magnet untuk memutarkan motor. Arah putaran aci bergantung kepada arah aliran arus. Putaran motor DC boleh dikawal dengan menggunakan pemacu motor."

*Berdasarkan kepada kenyataan di atas senaraikan **DUA (2)** jenis motor AT dan **DUA (2)** contoh pemacu motor.*

[4 marks]

[*4 markah*]

QUESTION 10

CLO1
C1

PIC is a popular microcontroller available in market. List **FOUR (4)** other microcontrollers that you can get in the market.

SOALAN 10

*PIC merupakan pengawalmikro terkenal yang mudah diperolehi dalam pasaran. Senaraikan **EMPAT (4)** lagi pengawalmikro yang boleh anda perolehi dalam pasaran.*

[4 marks]

[*4 markah*]

SECTION B: 60 MARKS
BAHAGIAN B: 60 MARKAH

INSTRUCTION:
This section consists of **THREE (3)** essay questions. Answer **ALL** questions.
ARAHAN:
Bahagian ini mengandungi TIGA (3) soalan esei. Jawab SEMUA soalan.

QUESTION 1
SOALAN 1

CLO1
C2

(a) Explain **FOUR (4)** features of embedded system.
Terangkan EMPAT (4) ciri-ciri sistem terbenam.

[4 marks]
[4 markah]

CLO1
C3

(b) List **FOUR (4)** products which related to embedded system application.
Senaraikan EMPAT (4) produk yang berkaitan dengan aplikasi sistem terbenam.

[4 marks]
[4 markah]

CLO1
C1

(c) List **FIVE (5)** names of Special Function Register (SFR) in PIC18 family.
Senaraikan LIMA (5) nama Daftar Fungsi Khas dalam keluarga PIC18.

[5 marks]
[5 markah]

CLO1
C2

(d) Arithmetic operation involve addition and subtraction operation. Identify the status register condition of C, DC and Z flag after executing addition operation between 8AH and 3CH.
Operasi aritmetik melibatkan operasi penambahan dan penolakan. Kenalpasti keadaan daftar status bagi bendera C, DC dan Z selepas perlaksanaan operasi penambahan antara 8AH dan 3CH.

[7 marks]
[7 markah]

QUESTION 2
SOALAN 2

A control system consists of a PIC microcontroller, two switches (active LOW), two LED (active HIGH). Switch 1 is connected to pin RB0, Switch 2 connected to pin RD7, LED1 connected to pin RA2 and LED2 connected to pin RA3.
Suatu sistem kawalan terdiri daripada pengawal mikro, dua suis (aktif rendah) dan dua LED (aktif tinggi). Suis 1 disambung kepada pin RB0, suis 2 disambung kepada pin RD7, LED1 disambung kepada pin RA2 dan LED2 disambung kepada pin RA3.

CLO1
C3

i.   Sketch a schematic diagram for the system. The diagram must include reset circuit.
Lakar gambarajah skematik untuk sistem. Rajah tersebut perlu mengandungi litar reset.

[10 marks]
[10 markah]

CLO1
C3

ii.   Write C language program for the control system to perform the given condition:

If the switch 1 is pushed, the LED1 will turn ON and LED2 will turn OFF .

If the switch 2 is pushed, the LED1 will turn OFF and LED2 will turn ON.

Tulis aturcara bahasa C bagi sistem kawalan untuk melaksanakan keadaan yang berikut:

Jika suis 1 ditekan, LED1 akan bercahaya dan LED2 akan padam.

Jika suis 2 ditekan, LED1 terpadam dan LED2 bercahaya.

[10 marks]

[*10 markah*]

QUESTION 3
SOALAN 3

CLO1
C3

One LED is connected to pin RB4. Write a C program using Timer0 to generate time delay to switch ON and OFF the LED. LED will ON for 512 ms and OFF for 512 ms. Setting for Timer0 are as below:

Satu LED disambung ke pin RB4. Tuliskan satu aturcara C dengan menggunakan Timer0 untuk menghasilkan lengah masa untuk menghidup dan mematikan LED tersebut. LED akan dihidupkan selama 512 ms dan dimatikan selama 512 ms. Tetapan Timer0 adalah seperti di bawah:

- 16 bit mode
- Prescale 1 : 64
- Internal instruction cycle clock
- Increment on low-to-high transition
- Crystal frequency is 10MHz.

Use Diagram B1 and B2 as references.

Gunakan Rajah B1 dan B2 sebagai rujukan:

[20 marks]

[*20 markah*]

REGISTER 11-1:   T0CON: TIMER0 CONTROL REGISTER

R/W-1	R/W-1	R/W-1	R/W-1	R/W-1	R/W-1	R/W-1	R/W-1
TMR0ON	T08BIT	T0CS	T0SE	PSA	T0PS2	T0PS1	T0PS0

bit 7   bit 0

Legend:		
R = Readable bit	W = Writable bit	U = Unimplemented bit, read as '0'
-n = Value at POR	'1' = Bit is set	'0' = Bit is cleared x = Bit is unknown

bit 7   **TMR0ON:** Timer0 On/Off Control bit
                  1 = Enables Timer0
                  0 = Stops Timer0

bit 6   **T08BIT:** Timer0 8-Bit/16-Bit Control bit
                  1 = Timer0 is configured as an 8-bit timer/counter
                  0 = Timer0 is configured as a 16-bit timer/counter

bit 5   **T0CS:** Timer0 Clock Source Select bit
                  1 = Transition on T0CKI pin
                  0 = Internal instruction cycle clock (CLKO)

bit 4   **T0SE:** Timer0 Source Edge Select bit
                  1 = Increment on high-to-low transition on T0CKI pin
                  0 = Increment on low-to-high transition on T0CKI pin

bit 3   **PSA:** Timer0 Prescaler Assignment bit
                  1 = Timer0 prescaler is not assigned. Timer0 clock input bypasses prescaler.
                  0 = Timer0 prescaler is assigned. Timer0 clock input comes from prescaler output.

bit 2-0   **T0PS<2:0>:** Timer0 Prescaler Select bits
                  111 = 1:256 Prescale value
                  110 = 1:128 Prescale value
                  101 = 1:64   Prescale value
                  100 = 1:32   Prescale value
                  011 = 1:16   Prescale value
                  010 = 1:8   Prescale value
                  001 = 1:4   Prescale value
                  000 = 1:2   Prescale value

Diagram B1 / *Rajah B1*

REGISTER 9-1:   INTCON: INTERRUPT CONTROL REGISTER

R/W-0	R/W-0	R/W-0	R/W-0	R/W-0	R/W-0	R/W-0	R/W-x
GIE/GIEH	PEIE/GIEL	TMR0IE	INT0IE	RBIE	TMR0IF	INT0IF	RBIF[1]
bit 7							bit 0

Legend:		
R = Readable bit	W = Writable bit	U = Unimplemented bit, read as '0'
-n = Value at POR	'1' = Bit is set	'0' = Bit is cleared x = Bit is unknown

bit 7   **GIE/GIEH:** Global Interrupt Enable bit

When IPEN = 0:
1 = Enables all unmasked interrupts
0 = Disables all interrupts

When IPEN = 1:
1 = Enables all high-priority interrupts
0 = Disables all interrupts

bit 6   **PEIE/GIEL:** Peripheral Interrupt Enable bit

When IPEN = 0:
1 = Enables all unmasked peripheral interrupts
0 = Disables all peripheral interrupts

When IPEN = 1:
1 = Enables all low-priority peripheral interrupts
0 = Disables all low-priority peripheral interrupts

bit 5   **TMR0IE:** TMR0 Overflow Interrupt Enable bit

1 = Enables the TMR0 overflow interrupt
0 = Disables the TMR0 overflow interrupt

bit 4   **INT0IE:** INT0 External Interrupt Enable bit

1 = Enables the INT0 external interrupt
0 = Disables the INT0 external interrupt

bit 3   **RBIE:** RB Port Change Interrupt Enable bit

1 = Enables the RB port change interrupt
0 = Disables the RB port change interrupt

bit 2   **TMR0IF:** TMR0 Overflow Interrupt Flag bit

1 = TMR0 register has overflowed (must be cleared in software)
0 = TMR0 register did not overflow

bit 1   **INT0IF:** INT0 External Interrupt Flag bit

1 = The INT0 external interrupt occurred (must be cleared in software)
0 = The INT0 external interrupt did not occur

bit 0   **RBIF:** RB Port Change Interrupt Flag bit[1]

1 = At least one of the RB<7:4> pins changed state (must be cleared in software)
0 = None of the RB<7:4> pins have changed state

Diagram B2 / *Rajah B2*

SOALAN TAMAT