SULIT

KEMENTERIAN PENDIDIKAN TINGGI
JABATAN PENDIDIKAN POLITEKNIK DAN KOLEJ KOMUNITI

BAHAGIAN PEPERIKSAAN DAN PENILAIAN
JABATAN PENDIDIKAN POLITEKNIK DAN KOLEJ KOMUNITI
KEMENTERIAN PENDIDIKAN TINGGI

JABATAN KEJURUTERAAN ELEKTRIK

PEPERIKSAAN AKHIR

SESI I : 2023/2024

BEU30063: MICROPROCESSOR AND MICROCONTROLLER

TARIKH : 10 JANUARI 2024
MASA : 9.00 AM – 12.00 PM (3 JAM)

Kertas ini mengandungi **LAPAN (8)** halaman bercetak.
Bahagian A: Subjektif (4 soalan)
Bahagian B: Esei (1 soalan)

Dokumen sokongan yang disertakan : Tiada

JANGAN BUKA KERTAS SOALAN INI SEHINGGA DIARAHKAN

(CLO yang tertera hanya sebagai rujukan)

SECTION A: 80 MARKS
BAHAGIAN A: 80 MARKAH

INSTRUCTION:
This section consists of **FOUR (4)** subjective questions. Answer **ALL** questions.

ARAHAN:
*Bahagian ini mengandungi **EMPAT (4)** soalan subjektif. Jawab **SEMUA** soalan.*

QUESTION 1
SOALAN 1

CLO1

a) The methods available for specifying an effective address are called addressing modes. List the types of addressing modes for each of following command:

```
ADD       (A2), D3
MOVE.B    -(A2), D4
ADD       A2, D3
MOVE.L    2(A0,D4.W),D3
```

Kaedah yang tersedia untuk menentukan alamat berkesan dipanggil mod pengalamatan. Senaraikan jenis mod pengalamatan untuk setiap arahan di bawah.

[4 marks]
[4 *markah*]

CLO1

b) Table A1(b) below shows the instructions for data transfer from memory. Note that all numbers are in hexadecimal. Visualize result after execution for each instruction in the memory location. Given Y=20000141.

Table A1(b)/*Jadual A1(b)*

```
MOVE.W    Y, D1
MOVE.L    Y, D2
MOVE.B    Y, D3
```

Jadual A1(b) di bawah menunjukkan arahan untuk perpindahan data dari memori. Ambil perhatian bahawa semua nombor adalah dalam perenambelasan. Gambarkan hasil selepas pelaksanaan untuk setiap arahan di lokasi memori. Diberi Y=20000141

[6 marks]

[6 *markah*]

CLO1

c) In Motorola 68000 series microprocessors, single instruction mnemonics can be used with different data types through a concept known as "data size extension". Demonstrate how a single instruction mnemonic can be used with different data types in MC68000 with an example in single instruction mnemonic.

Dalam mikropemproses siri Motorola 68000, mnemonik arahan tunggal boleh digunakan dengan jenis data yang berbeza melalui konsep yang dikenali sebagai "sambungan saiz data". Tunjukkan cara mnemonik arahan tunggal boleh digunakan dengan jenis data yang berbeza dalam MC68000 dengan contoh dalam mnemonik arahan tunggal.

[10 marks]

[10 *markah*]

QUESTION 2

SOALAN 2

CLO1 a) A 68000 system contains 1024 KB of RAM that can be divided among 32 users. Interpret how much of RAM receive for each users.

Sistem 68000 mengandungi 1024 KB RAM untuk dibahagikan kepada 32 pengguna. Tafsirkan berapa banyak RAM yang setiap pengguna dapat.

[4 marks]
[4 *markah*]

CLO1 b) Write assembly language programming by using address register indirect mode to add the first 10 longwords, starting at absolute location $2000. Leave the result in D0.

Tuliskan pengaturcaraan bahasa himpunan dengan menggunakan mod tidak langsung daftar alamat untuk menambah 10 kata panjang pertama, bermula dari lokasi mutlak $2000. Biarkan keputusan dalam D0.

[6 marks]
[6 *markah*]

CLO1 c) The Motorola 68000 microprocessor can interface with external devices through various methods and interfaces depending on the specific needs of the system. Determine **FIVE (5)** methods in which the 68000 may interface with external devices.

*Mikropemproses Motorola 68000 boleh antara muka dengan peranti luaran melalui pelbagai kaedah dan antara muka bergantung pada keperluan khusus system. Tentukan **LIMA (5)** kaedah di mana 68000 boleh antara muka dengan peranti luaran.*

[10 marks]
[10 *markah*]

QUESTION 3

SOALAN 3

CLO1

a) At the interface of input and output devices with the MC68000 microprocessor there is an interface chip or component such as PIO (Parallel Input/Output). Discuss **TWO (2)** examples of each input and output device.

*Pada antara muka peranti input dan output dengan mikropemproses MC68000 terdapat cip antara muka atau komponen seperti PIO (Parallel Input/Output). Bincangkan **DUA (2)** contoh bagi setiap peranti input dan output.*

[4 marks]

[4 *markah*]

CLO1

b) Microcontrollers and microprocessors are both integral components in the world of electronics and computing. Examine the differences in applications between microcontrollers and microprocessors, in terms of its purpose and complexity, power consumption and memory.

Mikropengawal dan mikropemproses adalah kedua-dua komponen penting dalam dunia elektronik dan pengkomputeran. Periksa perbezaan dalam aplikasi antara mikropengawal dan mikropemproses dari segi tujuan dan kerumitan, penggunaan kuasa dan ingatan.

[6 marks]

[6 *markah*]

CLO1

(c) Microprocessors play a fundamental role in modern calculators, enabling to perform arithmetic operations. Illustrate the block diagram of the microprocessor in calculator with specifies interfaces for the RAM, EPROM, and input/output.

Mikropemproses memainkan peranan asas dalam kalkulator moden, membolehkan untuk melaksanakan operasi aritmetik. Illustrasikan gambarajah blok mikropemproses dalam kalkulator dengan menentukan antara muka untuk RAM, EPROM dan input/output.

[10 marks]
[10 *markah*]

QUESTION 4
SOALAN 4

CLO1

a) PIC18Fxxxx interrupts are basically divided into two types, namely external and internal interrupts. Figure out the interfacing diagram application on the PIC18Fxxxx using an external interrupt. Toggle the LED, which is connected to the PORTC.0 pin, when an external interrupt occurs.

Gangguan PIC18Fxxxx pada asasnya dibahagikan kepada dua jenis, iaitu gangguan luaran dan dalaman. Fikirkan aplikasi rajah antara muka pada PIC18Fxxxx menggunakan gangguan luaran. Togol LED, yang disambungkan ke pin PORTC.0, apabila gangguan luaran berlaku.

[5 marks]
[5 *markah*]

CLO1 b) Assume XTAL=10MHz. Analyze the clock period fed into Timer0 if a pre-scalar option of 256 is chosen and the largest time delay can get using this pre-scalar option.

Andaikan XTAL=10MHz. Analisis tempoh jam yang dimasukkan ke dalam Pemasa0 jika pilihan pra-skala 256 dipilih dan kelewatan masa terbesar boleh diperoleh menggunakan pilihan pra-skalar ini.

[5 marks]
[5 *markah*]

CLO1 (c) LM35 is a temperature measuring device having an analog output voltage proportional to the temperature. The LM35 provides an output in analog form and is connected to the sensor pin of one of the ADC channels of the PIC18F4550. Propose connection diagram interface of the LM35 temperature sensor with the PIC18F4550 and display the surrounding temperature on the LCD16x2 display.

LM35 ialah peranti pengukur suhu yang mempunyai voltan keluaran analog berkadar dengan suhu. LM35 memberikan output dalam bentuk analog dan disambungkan ke pin penderia salah satu saluran ADC PIC18F4550. Cadangkan rajah sambungan antara muka penderia suhu LM35 dengan PIC18F4550 dan paparkan suhu sekeliling pada paparan LCD16x2.

[10 marks]
[10 *markah*]

SECTION B: 20 MARKS
BAHAGIAN B: 20 MARKAH

INSTRUCTION:
This section consists of **ONE (1)** essay question. Answer **ALL** questions.

ARAHAN:
*Bahagian ini mengandungi **SATU (1)** soalan esei. Jawab **SEMUA** soalan.*

QUESTION 1
SOALAN 1

CLO1

Salmah is a physiotherapist at a private rehabilitation centre in Penang. She was assigned to show how a stroke patient uses a wheelchair as a walking aid. Unfortunately, this device has no security features. Salmah was assigned to develop a safety feature using **ONE (1)** infrared sensor, which detects the speed of the wheelchair to provide the safety features of the wheelchair. When it exceeds the limit that has been detected, the wheelchair will stop operating.
Structure a C programme to solve the problem using the PICl8xxxx and the external hardware interrupt method (INT0) with the aid of a suitable circuit diagram to implement the program.
Salmah ialah seorang ahli fisioterapi di sebuah pusat pemulihan swasta di Pulau Pinang. Dia ditugaskan untuk menunjukkan bagaimana seorang pesakit strok menggunakan kerusi roda sebagai alat bantu berjalan. Malangnya, peranti ini tidak mempunyai ciri keselamatan. Dia ditugaskan untuk membangunkan ciri keselamatan menggunakan satu (1) sensor inframerah, yang mengesan kelajuan kerusi roda untuk meningkatkan ciri keselamatan mesin. Apabila ia melebihi had yang telah dikesan, kerusi roda akan berhenti beroperasi.
Strukturkan satu atur cara C untuk menyelesaikan masalah menggunakan PICl8xxxx dan kaedah gangguan perkakasan luaran (INT0) dengan bantuan gambar rajah litar yang sesuai untuk melaksanakan atur cara.

[20 marks]
[20 *markah*]

SOALAN TAMAT

APPENDIX

APPENDIX A1

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 (if GIE/GIEH = 1)
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 RB7:RB4 pins changed state (must be cleared in software)
0 = None of the RB7:RB4 pins have changed state

APPENDIX

APPENDIX A2

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 **T0PS2:T0PS0**: 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