
UNIVERSITI SAINS MALAYSIA

First Semester Examination
2016/2017 Academic Session

December 2016 / January 2017

EEE 320/3 – MICROPROCESSOR II

[MIKROPEMROSES II]

Duration : 2 hours
[Masa : 2 jam]

Please check that this examination paper consists of **NINE (9)** pages of printed material before you begin the examination. English version from page **TWO (2)** to page **FIVE (5)** and Malay version from page **SIX (6)** to page **NINE (9)**.

*Sila pastikan bahawa kertas peperiksaan ini mengandungi **SEMBILAN (9)** muka surat bercetak sebelum anda memulakan peperiksaan ini. Versi Bahasa Inggeris daripada muka surat **DUA (2)** sehingga muka surat **LIMA (5)** dan versi Bahasa Melayu daripada muka surat **ENAM (6)** sehingga muka surat **SEMBILAN (9)**.*

Instructions: This question paper consists of **FOUR (4)** questions. Answer **THREE (3)** questions. All questions carry the same marks.

***[Arahan:** Kertas soalan ini mengandungi **EMPAT (4)** soalan. Jawab **TIGA (3)** soalan. Semua soalan membawa jumlah markah yang sama]*

Answer to any question must start on a new page

[Mulakan jawapan anda untuk setiap soalan pada muka surat yang baharu].

“In the event of any discrepancies, the English version shall be used”.

[Sekiranya terdapat sebarang percanggahan pada soalan peperiksaan, versi Bahasa Inggeris hendaklah diguna pakai].

ENGLISH VERSION

1. (a) Identify the default segment register assigned to the following.

- (i) SP
- (ii) EBX
- (iii) DI
- (iv) EBP
- (v) SI

(20 marks)

(b) Explain what happens when PUSH BX instruction executes. Make sure to show where BH and BL are stored in both physical and logical address. (Assume that SP = 0100H and SS = 0200H)

(40 marks)

(c) Suppose that DS = 0200H, BX = 0300H and DI = 0400H. Determine the address accessed by each of the following instruction

- (i) MOV AL,[1234H]
- (ii) MOV EAX,[BX]
- (iii) MOV [DI],AL

(40 marks)

2. (a) Show which JMP instruction assembles (short, near or far) if the JMP THERE instruction is stored address 10000H and the address THERE is;

- (i) 10020H
- (ii) 11000H
- (iii) 0FFFEH
- (iv) 30000H

(30 marks)

(b) If an instruction that needs to be fetched is in physical memory location 389F2H. If CS = 2700H, does the segment range include it (physical memory location). If not, value should be assigned to CS if the IP must be 1282H?

(30 marks)

- (c) In some applications it is common practice to save all registers at the beginning of a subroutine. Assume that SP = 1288H before a subroutine CALL. Show the contents of the stack pointer and the exactly memory contents of the stack after PUSH F for the following

```
1132:0450      CALL PROC1
```

```
1132:0453      INC BX
```

```
PROC1  PROC
```

```
        PUSH AX
```

```
        PUSH BX
```

```
        PUSH CX
```

```
        PUSH DX
```

```
        PUSH SI
```

```
        PUSH DI
```

```
        PUSH F
```

```
PROC1  ENDP
```

(40 marks)

3. (a) State and explain the processor modes in ARM7 TDMI.

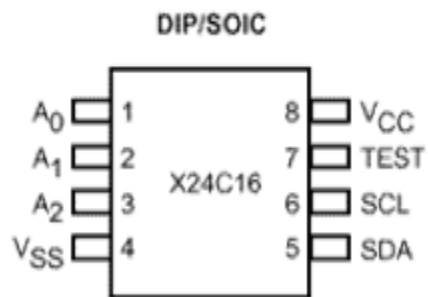
(30 marks)

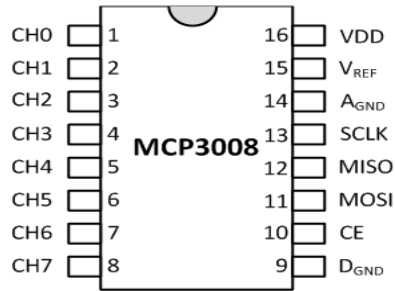
- (b) Consider the following example and determine in which processor mode the system is running:

- (i) Under normal circumstance, the processor is happily executing the code.
- (ii) Not much activity happens (aside from polling) until either a signal comes in or the user has pressed a key.
- (iii) The machine is about to loose power in a few milliseconds. A message should be sent to user to inform the situation.
- (iv) The processor sees an instruction in the pipeline that it does not recognize.

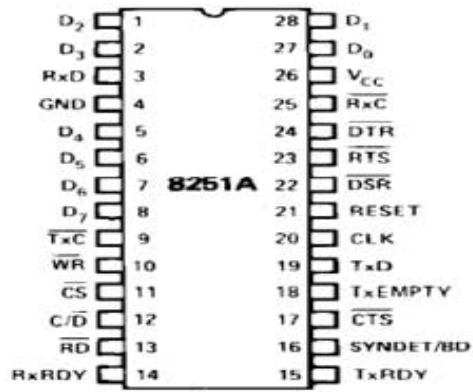
(20 marks)

- (c) Describe the difference of interrupt execution in ARM7 compared to any other microprocessor.
(30 marks)
- (d) What is the standard use of register r14, R13 and r15?
(20 marks)
- 4. (a) Explain and Calculate the effective address of the following instruction if register r3 = 004000 and register r4 = 0020:
LDR r7, [r3], r4
(15 marks)
- (b) Suppose that we had a register containing a binary value that needed to be normalized. In other words, we need to have the leading 1 in the most significant bit even if we have to shift it to get there. We also should record how many times we have shifted the value.
 - (i) Draw a flowchart for the normalization algorithm
 - (ii) Write an assembly language to perform the operation(40 marks)
- (c) Figure 4 shows three different devices with different communication protocol.
 - (i) State the communication protocol for each device
 - (ii) Explain the communication protocol for each device(45 marks)





(b)



(c)

Figure 4: Three different devices with different communication protocol

VERSI BAHASA MELAYU

1. (a) Tentukan segmen daftar lalai yang telah ditugaskan seperti dibawah.

- (i) SP
- (ii) EBX
- (iii) DI
- (iv) EBP
- (v) SI

(20 markah)

(b) Terangkan apa yang berlaku apabila arahan PUSH BX dilaksanakan. Pastikan untuk menunjukkan di mana BH dan BL disimpan di kedua-dua alamat fizikal dan logik. (Andaikan SP = 0100H dan SS = 0200H)

(40 markah)

(c) Katakan DS = 0200H, BX = 0300H dan DI = 0400H. Tentukan alamat yang dicapai oleh setiap arahan berikut

- (i) MOV AL,[1234H]
- (ii) MOV EAX,[BX]
- (iii) MOV [DI],AL

(40 markah)

2. (a) Tunjukkan yang mana arahan JMP berkaitan (pendek, dekat atau jauh) jika JMP THERE arahan disimpan address 10000H dan alamat THERE adalah;

- (i) 10020H
- (ii) 11000H
- (iii) 0FFFEH
- (iv) 30000H

(30 markah)

- (b) *Jika arahan yang perlu diambil adalah di lokasi memori fizikal 389F2H. Sekiranya CS = 2700H, adakah julat segmen akan termasuk didalamnya (lokasi memori fizikal). Jika tidak, nilai apakah perlu diberikan kepada CS jika IP mesti mengandungi 1282H?*
(30 markah)
- (c) *Dalam beberapa aplikasi ia adalah amalan biasa untuk menyelamatkan semua daftar pada awal subrutin. Andaikan SP = 1288H sebelum CALL subrutin. Tunjukkan kandungan penunjuk timbunan dan kandungan sebenar memori timbunan selepas PUSH F untuk yang berikut*

1132:0450 CALL PROC1

1132:0453 INC BX

PROC1 PROC

 PUSH AX

 PUSH BX

 PUSH CX

 PUSH DX

 PUSH SI

 PUSH DI

 PUSH F

PROC1 ENDP

(40 markah)

3. (a) *Nyatakan dan terangkan mod-mod pemproses dalam ARM7 TDMI*

(30 markah)

- (b) *Pertimbangkan contoh-contoh berikut dan tentukan mod pemproses yang manakah sedang digunakan oleh pemproses:*
- (i) *dalam keadaan normal, pemproses sedang melaksanakan program dengan jayanya.*
 - (ii) *Tidak banyak aktiviti yang berlaku (selain daripada polling) sehingga samada isyarat masuk ataupun pengguna menekan kekunci.*
 - (iii) *mesin tersebut akan kehilangan kuasa dalam beberapa millisecond. Satu pesanan akan dihantar untuk memberitahu pengguna tentang situasi ini.*
 - (iv) *Pemproses melihat terdapat satu arahan dalam pipeline yang ia tidak kenal.*

(20 markah)

- (c) *Terangkan perbezaan pelaksanaan sampukan dalam ARM7 berbanding dengan mikropemproses yang lain.*

(30 markah)

- (d) *Apakah kegunaan lazim untuk pendaftar r14, r13 dan r15?*

(20 markah)

4. (a) *Terangkan dan kirakan alamat yang berkesan bagi arahan berikut jika pendaftar r3 = 004000 dan pendaftar r4=0020:*

LDR r7, [r3], r4

(15 markah)

- (b) *Sekiranya kita mempunyai pendaftar yang mengandungi nilai binari yang perlu dinormalisasikan. Dalam kata lain, kita perlu ada logi 1 pada permulaan dalam bit paling berkesan walaupun kita perlu anjak untuk mendapatkannya. Kita juga perlu rekod berapa kali kita sudah menganjakkannya data tersebut.*

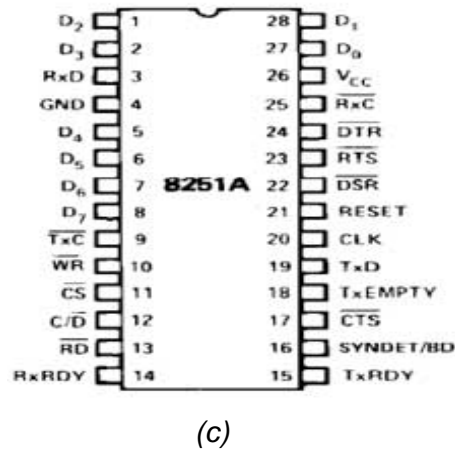
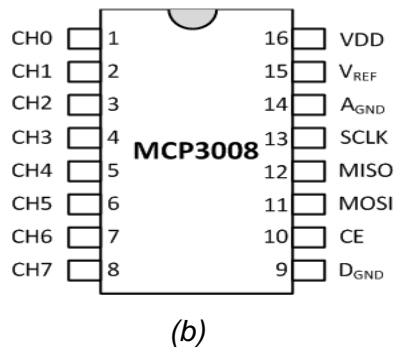
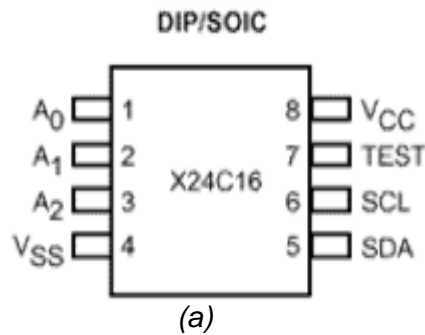
- (i) *Lukis carta alir untuk algoritma normalisasi tersebut*
- (ii) *Tulis bahasa penghimpun untuk melaksanakan operasi tersebut*

(40 markah)

(c) Rajah 4 menunjukkan tiga peranti yang berbeza dengan protokol komunikasi yang berbeza.

- (i) Nyatakan protokol komunikasi untuk setiap peranti
- (ii) Terangkan protokol komunikasi untuk setiap peranti

(45 markah)



Rajah 4: Tiga peranti yang berbeza dengan protokol komunikasi yang berbeza