
UNIVERSITI SAINS MALAYSIA

Second Semester Examination
Academic Session 2007/2008

April 2008

ZAT 281/3 – Introduction to Microprocessors
[Pengantar Mikropemproses]

Duration: 3 hours
[Masa : 3 jam]

Please ensure that this examination paper contains **SEVEN** printed pages before you begin the examination.

*[Sila pastikan bahawa kertas peperiksaan ini mengandungi **TUJUH** muka surat yang bercetak sebelum anda memulakan peperiksaan ini.]*

Instruction: Answer **all six (6)** questions. Students are allowed to answer all questions in Bahasa Malaysia or in English.

[Arahan: Jawab **semua enam (6)** soalan. Pelajar dibenarkan menjawab semua soalan sama ada dalam Bahasa Malaysia atau Bahasa Inggeris.]

1. Figure 1 is a 68000 program shown as a series of S-records.

[Rajah 1 merupakan aturcara 68000 yang menunjukkan suatu siri rekod-S.]

a) What is the starting address of the program?

[Apakah alamat permulaan aturcara tersebut?]

(20/100)

b) What is the length/size of the program?

[Berapakah panjang/saiz aturcara tersebut?]

(20/100)

c) What is the last address of the program?]

[Apakah alamat terakhir aturcara?]

(20/100)

d) How are checksum determined for every line of the S-records?

[Bagaimanakah periksa jumlah ditentukan untuk setiap baris rekod-S tersebut?]

(20/100)

e) List step by step the write cycle timing operation of 68000 microprocessor system.

[Senaraikan langkah demi langkah pemasa kitaran tulis bagi sistem mikropemproses 68000.]

(20/100)

```
S00600006F666CB8
S2144004207270343CDAFF163C0019027C0000D2039E
S2084004304E4B0000EA
S9030000FC
```

Figure 1 *[Rajah 1]*

2. Solve the following problems on 68000 microprocessor system:

[Selesaikan permasalahan sistem mikropemproses 68000 berikut:]

a) Give the size of memory location that can be allocated by microprocessor 68000.

[Berikan saiz lokasi ingatan yang boleh diberikan oleh sistem mikropemproses 68000.]

(20/100)

- b) If 256 byte of RAM located with first memory location is \$00400400, what is the last memory location of the RAM?

[Jika RAM bersais 256 byte diletakkan dengan lokasi pertamanya ialah \$00400400, apakah lokasi terakhir RAM tersebut?]

(20/100)

- c) If the memory of 68000 microprocessor system is divided into four blocks, draw the memory map of the microprocessor system and give the starting address and the last address of the memory location for each block.

[Sekiranya ingatan sistem mikropemproses 68000 dibahagikan kepada empat blok, lakarkan peta ingatan sistem mikropemproses dan berikan lokasi alamat permulaan dan akhiran bagi setiap blok.]

(20/100)

- d) If the RAM can also be accessed through address \$00C00400, describe how this condition happened and what is it normally called?

[Jika RAM boleh juga dicapai melalui alamat \$00C00400, terangkan bagaimanakah keadaan ini berlaku dan biasanya ia dikenali sebagai apa?]

(20/100)

- e) By using multi-input NOR gate, show how RAM decoding in b) and d) can be implemented.

[Dengan menggunakan get tak-atau multi-input tunjukkan bagaimanakah penyahkod RAM dalam b) dan d) boleh dilaksanakan.]

(20/100)

```

1          *          PROGRAM TEST 1
2          *          DELAY
3          *          ex.SRC
4
5 00A00007      PBDDR EQU    $A00007
6 00A00013      PBDR  EQU    $A00013
7 00400400      PROGRAM EQU   $400400      PROGRAM RAM AREA
8 00400500      DATA  EQU   $400500      LOKASI DATA
9 00400600      SPLOC  EQU   $400600
10
11 00400500      ORG    DATA
12 00400500 0000A000 DELY  DC.L  $A000      MENENTUKAN MASA DELAY
13
14 00400400      ORG    PROGRAM      ALAMAT MULA
15 00400400 13FC00FF START MOVE.B  #$FF,PBDDR  SET PORT B AS OUTPUT
00400404 00A00007
16 00400408 203CF0BA      MOVE.L  #$F0BACA7F,D0  SET COUNTER (D0)
0040040C CA7F
17 0040040E 163C00FF      MOVE.B  #$FF,D3
18 00400412 2E7C0040      MOVE.L  #SPLOC,A7
00400416 0600
19
20 00400418 13C000A0 ULANG MOVE.B  D0,PBDR      OUTPUT COUNTER ON LED'S
0040041C 0013
21 0040041E 6100000E      BSR    DELAY      DELAY
22
23 00400422 5300          SUBQ.B  #$01,D0
24 00400424 1400          MOVE.B  D0,D2
25 00400426 B702          EOR.B  D3,D2
26 00400428 66EE          BNE    ULANG
27 0040042A 4E4B          TRAP   #11
28 0040042C 0000          DC.W  0
29
30          *****
31          *          SUBROUTINE DELAY
32 0040042E 22390040 DELAY MOVE.L  DELY,D1      SET DELAY TIME [8]
00400432 0500
33 00400434 5381          NEXT  SUBQ.L  #1,D1      DECREMENT TO 0 [8]
00400436 66FC          BNE.S  NEXT      [10/12]
34 00400438 4E75          RTS          RETURN FROM SUBROUTINE [16]
35 0040043A          END

```

Figure 2 Subroutine delay (The numbers in bracket [] are the execution time)
[Subrutin pelengahan (Nombor dalam kurungan [] menunjukkan masa pelaksanaannya)]

3. Figure 2 shows a listing file of a delay program of Abitec microprocessor system in Applied Physics Lab USM.

[Rajah 4 menunjukkan fail listing aturcara subrutin pelengahan sistem mikropemproses Abitec di dalam Makmal Fizik Gunaan USM.]

- a) What is the difference between instruction BRA and BSR used in the program in Figure 2?
[Apakah perbezaan antara arahan BRA dengan BSR yang digunakan dalam aturcara di dalam Rajah 2?]
- b) What is the value in the Stack Pointer (SP) and stack location at the time the microprocessor executes the subroutine delay?
[Apakah nilai penunjuk stack (SP) dan lokasi stack semasa mikropemproses melaksanakan subrutin perlambatan?]
- c) Why should the opcode of BSR DELAY be \$6100000E?
[Kenapakah opkod BSR DELAY adalah \$6100000E?]
- d) What is the value of the Program Counter (PC) immediately after the execution of instruction BSR DELAY?
[Apakah nilai pembilang program (PC) sebaik sahaja selepas pelaksanaan arahan BSR DELAY?]
- e) Describe how approximately 0.5 second delay time can be generated by using the delay subroutine in figure 2 if the speed of the microprocessor is 10MHz.
[Terangkan bagaimana masa pelengahan lebih kurang 0.5 saat dijana dengan menggunakan subrutin perlengahan dalam rajah 2 sekiranya kelajuan mikropemproses ialah 10MHz.]
4. a) Draw a schematic diagram of status register and explain the function for every bit.
[Lukiskan gambarajah skematik alatdaftar status dan jelaskan fungsi setiap bit.]

(50/100)

- b) List the vector TRAPs and give their respective vector numbers and addresses and also explain their function.
[Senaraikan vektor TRAP dan berikan nombor dan alamat vektor masing-masing serta terangkan fungsi mereka.]

(50/100)

5. Solve the following problems:

[Selesaikan permasalahan berikut:]

- a) Write a test program for testing the ability of the microprocessor in accessing a RAM occupying the memory location from \$00400400 to \$004005FF.

[Tuliskan aturcara ujian untuk menguji keupayaan mikropemproses mencapai RAM yang menghuni lokasi dari \$00400400 ke \$004005FF.]

(25/100)

- b) Explain how the operation of the test program in testing the accessibility of the RAM.

[Terangkan bagaimana operasi program ujian menguji kebolehcapaian kepada RAM.]

(25/100)

- c) Draw the timing diagram of AS and R/W (use Appendix A), when the microprocessor can access the RAM.

[Lakarkan Rajah pemasa AS dan R/W (gunakan Lampiran A), apabila mikropemproses berjaya mencapai RAM.]

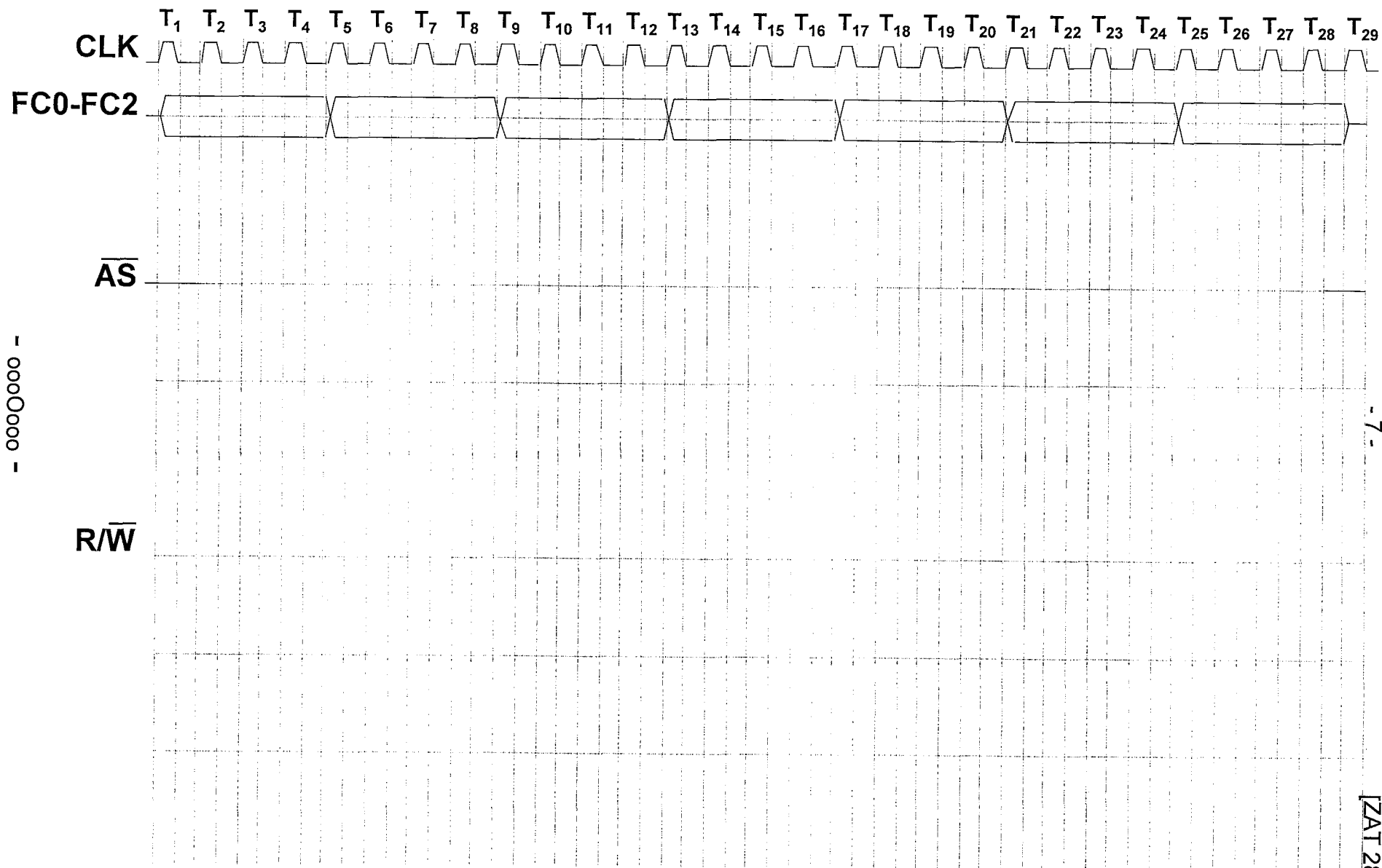
(25/100)

- d) Explain how standing signals can be produced on the oscilloscope screen if probes are connected onto the AS and R/W pins of the microprocessor.

[Terangkan bagaimana isyarat pegun dihasilkan di layar osiloskop apabila probnya disambung kepada pin AS dan R/W mikropemproses.]

(25/100)

Appendix A



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- 7 -