Partiel S3 – Corrigé
Architecture des ordinateurs

Durée : 1 h 30

Répondre exclusivement sur le document réponse.

Exercice 1 (4 points)

Remplir le tableau présent sur le document réponse. Donnez le nouveau contenu des registres (sauf le **PC**) et/ou de la mémoire modifiés par les instructions. **Vous utiliserez la représentation hexadécimale**. **La mémoire et les registres sont réinitialisés à chaque nouvelle instruction.**

```
Valeurs initiales :   D0 = $FFFF0010  A0 = $00005000  PC = $00006000
                      D1 = $0000FFEE  A1 = $00005008
                      D2 = $FFFFFFF9  A2 = $00005010


                      $005000  54 AF 18 B9 E7 21 48 C0
                      $005008  C9 10 11 C8 D4 36 1F 88
                      $005010  13 79 01 80 42 1A 2D 49
```

Exercice 2 (3 points)

Remplir le tableau présent sur le document réponse. Vous devez trouver le nombre manquant (sous sa forme hexadécimale) en fonction de la taille de l'opération et de la valeur des *flags* après l'opération. **Si plusieurs solutions sont possibles, vous retiendrez uniquement la plus petite.**

Exercice 3 (4 points)

Soit le programme ci-dessous. Complétez le tableau présent sur le document réponse.

```
Main        move.l  #$ff,d7

next1       moveq.l #1,d1
            cmpi.l  #$01,d7
            bgt     next2
            moveq.l #2,d1

next2       clr.l   d2
            move.l  #$11112222,d0
loop2       addq.l  #1,d2
            subq.w  #2,d0
            bne     loop2

next3       clr.l   d3
loop3       addq.l  #1,d3
            dbra    d0,loop3      ; DBRA = DBF

next4       clr.l   d4
            move.l  #$12345678,d0
loop4       addq.l  #1,d4
            dbra    d0,loop4      ; DBRA = DBF
```

Exercice 4 (9 points)

Toutes les questions de cet exercice sont indépendantes. **À l'exception des registres utilisés pour renvoyer une valeur de sortie, aucun registre de donnée ou d'adresse ne devra être modifié en sortie de vos sous-programmes.** Une chaîne de caractères se termine toujours par un caractère nul (la valeur zéro). On dira qu'un caractère est blanc s'il s'agit d'un caractère *espace* ou d'un caractère *tabulation*.

1. Réalisez le sous-programme **IsBlank** qui détermine si un caractère est blanc (c'est-à-dire s'il s'agit d'un espace ou d'une tabulation).

   Entrée : **D1.B** contient le code ASCII du caractère à tester.

   Sortie : Si le caractère est blanc, **D0.L** renvoie 0.

   Si le caractère n'est pas blanc, **D0.L** renvoie 1.

   Indication : La valeur numérique du code ASCII du caractère *tabulation* est 9.

2. Réalisez le sous-programme **BlankCount** qui renvoie le nombre de caractères blancs dans une chaîne de caractères. Pour savoir si un caractère est blanc, vous utiliserez le sous-programme **IsBlank**.

   Entrée : **A0.L** pointe sur une chaîne de caractères.

   Sortie : **D0.L** renvoie le nombre de caractères blancs de la chaîne.

   Indications :
   • Utilisez le registre **D2** comme compteur de caractères blancs (car **D0** est utilisé par **IsBlank**).
   • Copier ensuite **D2** dans **D0** avant de sortir du sous-programme.

3. Réalisez le sous-programme **BlankToUnderscore** qui convertit les caractères blancs d'une chaîne de caractères en caractères *underscore*. Pour savoir si un caractère est blanc, vous utiliserez le sous-programme **IsBlank**.
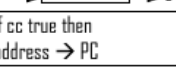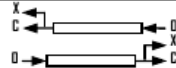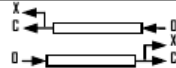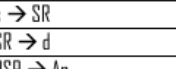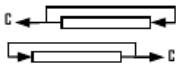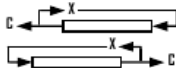
   Entrée : **A0.L** pointe sur une chaîne de caractères.

   Sortie : Les caractères blancs de la chaîne sont remplacés par des caractères « _ ».

EASy68K Quick Reference v1.8   http://www.wowgwep.com/EASy68K.htm   Copyright © 2004-2007 By: Chuck Kelly

Opcode	Size	Operand	CCR	Dn	An	(An)	(An)+	-(An)	(i,An)	(i,An,Rn)	abs.W	abs.L	(i,PC)	(i,PC,Rn)	#n	Operation	Description
	BWL	s,d	XNZVC	Dn	An	(An)	(An)+	-(An)	(i,An)	(i,An,Rn)	abs.W	abs.L	(i,PC)	(i,PC,Rn)	#n	Effective Address s=source, d=destination, e=either, i=displacement	
ABCD	B	Dy,Dx	*U*U*	e	-	-	-	-	-	-	-	-	-	-	-	$Dy_{10} + Dx_{10} + X \rightarrow Dx_{10}$	Add BCD source and eXtend bit to
		-(Ay),-(Ax)		-	-	-	-	e	-	-	-	-	-	-	-	$-(Ay)_{10} + -(Ax)_{10} + X \rightarrow -(Ax)_{10}$	destination, BCD result
ADD [4]	BWL	s,Dn	*****	e	s	s	s	s	s	s	s	s	s	s	s[4]	$s + Dn \rightarrow Dn$	Add binary (ADDI or ADDQ is used when
		Dn,d		e	d[4]	d	d	d	d	d	d	d	-	-	-	$Dn + d \rightarrow d$	source is #n. Prevent ADDQ with #n.L)
ADDA [4]	WL	s,An	------	s	e	s	s	s	s	s	s	s	s	s	s	$s + An \rightarrow An$	Add address (.W sign-extended to .L)
ADDI [4]	BWL	#n,d	*****	d	-	d	d	d	d	d	d	d	-	-	s	$\#n + d \rightarrow d$	Add immediate to destination
ADDQ [4]	BWL	#n,d	*****	d	d	d	d	d	d	d	d	d	-	-	s	$\#n + d \rightarrow d$	Add quick immediate (#n range: I to 8)
ADDX	BWL	Dy,Dx	*****	e	-	-	-	-	-	-	-	-	-	-	-	$Dy + Dx + X \rightarrow Dx$	Add source and eXtend bit to destination
		-(Ay),-(Ax)		-	-	-	-	e	-	-	-	-	-	-	-	$-(Ay) + -(Ax) + X \rightarrow -(Ax)$	
AND [4]	BWL	s,Dn	-**00	e	-	s	s	s	s	s	s	s	s	s	s[4]	$s \text{ AND } Dn \rightarrow Dn$	Logical AND source to destination
		Dn,d		e	-	d	d	d	d	d	d	d	-	-	-	$Dn \text{ AND } d \rightarrow d$	(ANDI is used when source is #n)
ANDI [4]	BWL	#n,d	-**00	d	-	d	d	d	d	d	d	d	-	-	s	$\#n \text{ AND } d \rightarrow d$	Logical AND immediate to destination
ANDI [4]	B	#n,CCR	=====	-	-	-	-	-	-	-	-	-	-	-	s	$\#n \text{ AND } CCR \rightarrow CCR$	Logical AND immediate to CCR
ANDI [4]	W	#n,SR	=====	-	-	-	-	-	-	-	-	-	-	-	s	$\#n \text{ AND } SR \rightarrow SR$	Logical AND immediate to SR (Privileged)
ASL ASR	BWL	Dx,Dy	*****	e	-	-	-	-	-	-	-	-	-	-	-		Arithmetic shift Dy by Dx bits left/right
		#n,Dy		d	-	-	-	-	-	-	-	-	-	-	s		Arithmetic shift Dy #n bits L/R (#n: I to 8)
	W	d		-	-	d	d	d	d	d	d	d	-	-	-		Arithmetic shift ds I bit left/right (.W only)
Bcc	BW[3]	address[2]	------	-	-	-	-	-	-	-	-	-	-	-	-	if cc true then address $\rightarrow$ PC	Branch conditionally (cc table on back) (8 or 16-bit ± offset to address)
BCHG	B L	Dn,d	--*--	e[I]	-	d	d	d	d	d	d	d	-	-	-	NOT(bit number of d) $\rightarrow$ Z	Set Z with state of specified bit in d then
		#n,d		d[I]	-	d	d	d	d	d	d	d	-	-	s	NOT(bit n of d) $\rightarrow$ bit n of d	invert the bit in d
BCLR	B L	Dn,d	--*--	e[I]	-	d	d	d	d	d	d	d	-	-	-	NOT(bit number of d) $\rightarrow$ Z	Set Z with state of specified bit in d then
		#n,d		d[I]	-	d	d	d	d	d	d	d	-	-	s	$0 \rightarrow$ bit number of d	clear the bit in d
BRA	BW[3]	address[2]	------	-	-	-	-	-	-	-	-	-	-	-	-	address $\rightarrow$ PC	Branch always (8 or 16-bit ± offset to addr)
BSET	B L	Dn,d	--*--	e[I]	-	d	d	d	d	d	d	d	-	-	-	NOT(bit n of d) $\rightarrow$ Z	Set Z with state of specified bit in d then
		#n,d		d[I]	-	d	d	d	d	d	d	d	-	-	s	$I \rightarrow$ bit n of d	set the bit in d
BSR	BW[3]	address[2]	------	-	-	-	-	-	-	-	-	-	-	-	-	PC $\rightarrow$ -(SP); address $\rightarrow$ PC	Branch to subroutine (8 or 16-bit ± offset)
BTST	B L	Dn,d	--*--	e[I]	-	d	d	d	d	d	d	d	d	d	-	NOT(bit Dn of d) $\rightarrow$ Z	Set Z with state of specified bit in d
		#n,d		d[I]	-	d	d	d	d	d	d	d	d	d	s	NOT(bit #n of d) $\rightarrow$ Z	Leave the bit in d unchanged
CHK	W	s,Dn	-*UUU	e	-	s	s	s	s	s	s	s	s	s	s	if Dn<0 or Dn>s then TRAP	Compare Dn with 0 and upper bound [s]
CLR	BWL	d	-0100	d	-	d	d	d	d	d	d	d	-	-	-	$0 \rightarrow d$	Clear destination to zero
CMP [4]	BWL	s,Dn	-****	e	s[4]	s	s	s	s	s	s	s	s	s	s[4]	set CCR with Dn – s	Compare Dn to source
CMPA [4]	WL	s,An	-****	s	e	s	s	s	s	s	s	s	s	s	s	set CCR with An – s	Compare An to source
CMPI [4]	BWL	#n,d	-****	d	-	d	d	d	d	d	d	d	-	-	s	set CCR with d - #n	Compare destination to #n
CMPM [4]	BWL	(Ay)+,(Ax)+	-****	-	-	-	e	-	-	-	-	-	-	-	-	set CCR with (Ax) - (Ay)	Compare (Ax) to (Ay); Increment Ax and Ay
DBcc	W	Dn,address[2]	------	-	-	-	-	-	-	-	-	-	-	-	-	if cc false then { Dn-I $\rightarrow$ Dn if Dn <> -I then addr $\rightarrow$ PC }	Test condition, decrement and branch (16-bit ± offset to address)
DIVS	W	s,Dn	-***0	e	-	s	s	s	s	s	s	s	s	s	s	±32bit Dn / ±16bit s $\rightarrow$ ±Dn	Dn= [16-bit remainder, 16-bit quotient]
DIVU	W	s,Dn	-***0	e	-	s	s	s	s	s	s	s	s	s	s	32bit Dn / 16bit s $\rightarrow$ Dn	Dn= [16-bit remainder, 16-bit quotient]
EOR [4]	BWL	Dn,d	-**00	e	-	d	d	d	d	d	d	d	-	-	s[4]	Dn XOR d $\rightarrow$ d	Logical exclusive OR Dn to destination
EORI [4]	BWL	#n,d	-**00	d	-	d	d	d	d	d	d	d	-	-	s	$\#n$ XOR d $\rightarrow$ d	Logical exclusive OR #n to destination
EORI [4]	B	#n,CCR	=====	-	-	-	-	-	-	-	-	-	-	-	s	$\#n$ XOR CCR $\rightarrow$ CCR	Logical exclusive OR #n to CCR
EORI [4]	W	#n,SR	=====	e	-	-	-	-	-	-	-	-	-	-	s	$\#n$ XOR SR $\rightarrow$ SR	Logical exclusive OR #n to SR (Privileged)
EXG	L	Rx,Ry	------	e	e	-	-	-	-	-	-	-	-	-	-	register $\leftarrow\rightarrow$ register	Exchange registers (32-bit only)
EXT	WL	Dn	-**00	d	-	-	-	-	-	-	-	-	-	-	-	Dn.B $\rightarrow$ Dn.W	Dn.W $\rightarrow$ Dn.L	Sign extend (change .B to .W or .W to .L)
ILLEGAL			------	-	-	-	-	-	-	-	-	-	-	-	-	PC $\rightarrow$ -(SSP); SR $\rightarrow$ -(SSP)	Generate Illegal Instruction exception
JMP		d	------	-	-	d	-	-	d	d	d	d	d	d	-	$\uparrow d \rightarrow$ PC	Jump to effective address of destination
JSR		d	------	-	-	d	-	-	d	d	d	d	d	d	-	PC $\rightarrow$ -(SP); $\uparrow d \rightarrow$ PC	push PC, jump to subroutine at address d
LEA	L	s,An	------	-	e	s	-	-	s	s	s	s	s	s	-	$\uparrow s \rightarrow$ An	Load effective address of s to An
LINK		An,#n	------	-	-	-	-	-	-	-	-	-	-	-	-	An $\rightarrow$ -(SP); SP $\rightarrow$ An; SP + #n $\rightarrow$ SP	Create local workspace on stack (negative n to allocate space)
LSL LSR	BWL	Dx,Dy	***0*	e	-	-	-	-	-	-	-	-	-	-	-		Logical shift Dy, Dx bits left/right
		#n,Dy		d	-	-	-	-	-	-	-	-	-	-	s		Logical shift Dy, #n bits L/R (#n: I to 8)
	W	d		-	-	d	d	d	d	d	d	d	-	-	-		Logical shift d I bit left/right (.W only)
MOVE [4]	BWL	s,d	-**00	e	s[4]	e	e	e	e	e	e	e	s	s	s[4]	$s \rightarrow d$	Move data from source to destination
MOVE	W	s,CCR	=====	s	-	s	s	s	s	s	s	s	s	s	s	$s \rightarrow$ CCR	Move source to Condition Code Register
MOVE	W	s,SR	=====	s	-	s	s	s	s	s	s	s	s	s	s	$s \rightarrow$ SR	Move source to Status Register (Privileged)
MOVE	W	SR,d	------	d	-	d	d	d	d	d	d	d	-	-	-	SR $\rightarrow$ d	Move Status Register to destination
MOVE	L	USP,An	------	-	d	-	-	-	-	-	-	-	-	-	-	USP $\rightarrow$ An	Move User Stack Pointer to An (Privileged)
		An,USP		-	s	-	-	-	-	-	-	-	-	-	-	An $\rightarrow$ USP	Move An to User Stack Pointer (Privileged)
	BWL	s,d	XNZVC	Dn	An	(An)	(An)+	-(An)	(i,An)	(i,An,Rn)	abs.W	abs.L	(i,PC)	(i,PC,Rn)	#n		

Opcode	Size	Operand	CCR XNZVC	Dn	An	(An)	(An)+	-(An)	(i,An)	(i,An,Rn)	abs.W	abs.L	(i,PC)	(i,PC,Rn)	#n	Operation	Description
MOVEA[4]	WL	s,An	-----	s	e	s	s	s	s	s	s	s	s	s	s	s → An	Move source to An (MOVE s,An use MOVEA)
MOVEM[4]	WL	Rn-Rn,d	-----	-	-	d	-	d	d	d	d	d	-	-	-	Registers → d	Move specified registers to/from memory
		s,Rn-Rn		-	-	s	s	-	s	s	s	s	s	s	-	s → Registers	(.W source is sign-extended to .L for Rn)
MOVEP	WL	Dn,(i,An)	-----	s	-	-	-	-	d	-	-	-	-	-	-	Dn → (i,An)...(i+2,An)...(i+4,A.	Move Dn to/from alternate memory bytes
		(i,An),Dn		d	-	-	-	-	s	-	-	-	-	-	-	(i,An) → Dn...(i+2,An)...(i+4,A.	(Access only even or odd addresses)
MOVEQ[4]	L	#n,Dn	-**00	d	-	-	-	-	-	-	-	-	-	-	s	#n → Dn	Move sign extended 8-bit #n to Dn
MULS	W	s,Dn	-**00	e	-	s	s	s	s	s	s	s	s	s	s	±16bit s * ±16bit Dn → ±Dn	Multiply signed 16-bit; result: signed 32-bit
MULU	W	s,Dn	-**00	e	-	s	s	s	s	s	s	s	s	s	s	16bit s * 16bit Dn → Dn	Multiply unsig'd 16-bit; result: unsig'd 32-bit
NBCD	B	d	*U*U*	d	-	d	d	d	d	d	d	d	-	-	-	$0 - d_{10} - X$ → d	Negate BCD with eXtend, BCD result
NEG	BWL	d	*****	d	-	d	d	d	d	d	d	d	-	-	-	0 - d → d	Negate destination (2's complement)
NEGX	BWL	d	*****	d	-	d	d	d	d	d	d	d	-	-	-	0 - d - X → d	Negate destination with eXtend
NOP			------	-	-	-	-	-	-	-	-	-	-	-	-	None	No operation occurs
NOT	BWL	d	-**00	d	-	d	d	d	d	d	d	d	-	-	-	NOT(d) → d	Logical NOT destination (1's complement)
OR[4]	BWL	s,Dn	-**00	e	-	s	s	s	s	s	s	s	s	s[4]	s	s OR Dn → Dn	Logical OR
		Dn,d		e	-	d	d	d	d	d	d	d	-	-	-	Dn OR d → d	(ORI is used when source is #n)
ORI[4]	BWL	#n,d	-**00	d	-	d	d	d	d	d	d	d	-	-	s	#n OR d → d	Logical OR #n to destination
ORI[4]	B	#n,CCR	=====	-	-	-	-	-	-	-	-	-	-	-	s	#n OR CCR → CCR	Logical OR #n to CCR
ORI[4]	W	#n,SR	=====	-	-	-	-	-	-	-	-	-	-	-	s	#n OR SR → SR	Logical OR #n to SR (Privileged)
PEA	L	s	------	-	-	s	-	-	s	s	s	s	s	s	-	↑s → -(SP)	Push effective address of s onto stack
RESET			------	-	-	-	-	-	-	-	-	-	-	-	-	Assert RESET Line	Issue a hardware RESET (Privileged)
ROL	BWL	Dx,Dy	-**0*	e	-	-	-	-	-	-	-	-	-	-	-		Rotate Dy, Dx bits left/right (without X)
ROR		#n,Dy		d	-	-	-	-	-	-	-	-	-	-	s		Rotate Dy, #n bits left/right (#n: 1 to 8)
	W	d		-	-	d	d	d	d	d	d	d	-	-	-		Rotate d 1-bit left/right (.W only)
ROXL	BWL	Dx,Dy	***0*	e	-	-	-	-	-	-	-	-	-	-	-		Rotate Dy, Dx bits L/R, X used then updated
ROXR		#n,Dy		d	-	-	-	-	-	-	-	-	-	-	s		Rotate Dy, #n bits left/right (#n: 1 to 8)
	W	d		-	-	d	d	d	d	d	d	d	-	-	-		Rotate destination 1-bit left/right (.W only)
RTE			=====	-	-	-	-	-	-	-	-	-	-	-	-	(SP)+ → SR; (SP)+ → PC	Return from exception (Privileged)
RTR			=====	-	-	-	-	-	-	-	-	-	-	-	-	(SP)+ → CCR, (SP)+ → PC	Return from subroutine and restore CCR
RTS			------	-	-	-	-	-	-	-	-	-	-	-	-	(SP)+ → PC	Return from subroutine
SBCD	B	Dy,Dx	*U*U*	e	-	-	-	-	-	-	-	-	-	-	-	$Dx_{10} - Dy_{10} - X$ → Dx_{10}	Subtract BCD source and eXtend bit from
		-(Ay),-(Ax)		-	-	-	-	e	-	-	-	-	-	-	-	$-(Ax)_{10} - (Ay)_{10} - X$ → $-(Ax)_{10}$	destination, BCD result
Scc	B	d	------	d	-	d	d	d	d	d	d	d	-	-	-	If cc is true then 1's → d else 0's → d	If cc true then d.B = 11111111 else d.B = 00000000
STOP		#n	=====	-	-	-	-	-	-	-	-	-	-	-	s	#n → SR; STOP	Move #n to SR, stop processor (Privileged)
SUB[4]	BWL	s,Dn	*****	e	s	s	s	s	s	s	s	s	s	s	s[4]	Dn - s → Dn	Subtract binary (SUBI or SUBQ used when
		Dn,d		e	d[4]	d	d	d	d	d	d	d	-	-	-	d - Dn → d	source is #n. Prevent SUBQ with #n.L)
SUBA[4]	WL	s,An	------	s	e	s	s	s	s	s	s	s	s	s	s	An - s → An	Subtract address (.W sign-extended to .L)
SUBI[4]	BWL	#n,d	*****	d	-	d	d	d	d	d	d	d	-	-	s	d - #n → d	Subtract immediate from destination
SUBQ[4]	BWL	#n,d	*****	d	d	d	d	d	d	d	d	d	-	-	s	d - #n → d	Subtract quick immediate (#n range: 1 to 8)
SUBX	BWL	Dy,Dx	*****	e	-	-	-	-	-	-	-	-	-	-	-	Dx - Dy - X → Dx	Subtract source and eXtend bit from
		-(Ay),-(Ax)		-	-	-	-	e	-	-	-	-	-	-	-	-(Ax) - (Ay) - X → -(Ax)	destination
SWAP	W	Dn	-**00	d	-	-	-	-	-	-	-	-	-	-	-	bits[31:16] ↔ bits[15:0]	Exchange the 16-bit halves of Dn
TAS	B	d	-**00	d	-	d	d	d	d	d	d	d	-	-	-	test d → CCR; 1 → bit7 of d	N and Z set to reflect d, bit7 of d set to 1
TRAP		#n	------	-	-	-	-	-	-	-	-	-	-	-	s	PC → -(SSP);SR → -(SSP); (vector table entry) → PC	Push PC and SR, PC set by vector table #n (#n range: 0 to 15)
TRAPV			------	-	-	-	-	-	-	-	-	-	-	-	-	If V then TRAP #7	If overflow, execute an Overflow TRAP
TST	BWL	d	-**00	d	-	d	d	d	d	d	d	d	-	-	-	test d → CCR	N and Z set to reflect destination
UNLK		An	------	-	d	-	-	-	-	-	-	-	-	-	-	An → SP; (SP)+ → An	Remove local workspace from stack
	BWL	s,d	XNZVC	Dn	An	(An)	(An)+	-(An)	(i,An)	(i,An,Rn)	abs.W	abs.L	(i,PC)	(i,PC,Rn)	#n		

Condition Tests (+ OR, ! NOT, ⊕ XOR; [u] Unsigned, [a] Alternate cc)

cc	Condition	Test	cc	Condition	Test
T	true	1	VC	overflow clear	!V
F	false	0	VS	overflow set	V
HI[u]	higher than	!(C + Z)	PL	plus	!N
LS[u]	lower or same	C + Z	MI	minus	N
HS[u], CC[a]	higher or same	!C	GE	greater or equal	!(N ⊕ V)
LO[u], CS[a]	lower than	C	LT	less than	(N ⊕ V)
NE	not equal	!Z	GT	greater than	![(N ⊕ V) + Z]
EQ	equal	Z	LE	less or equal	(N ⊕ V) + Z

An	Address register (16/32-bit, n=0-7)
Dn	Data register (8/16/32-bit, n=0-7)
Rn	any data or address register
s	Source, d Destination
e	Either source or destination
#n	Immediate data, i Displacement
BCD	Binary Coded Decimal
↑	Effective address
2	Long only; all others are byte only
2	Assembler calculates offset
3	Branch sizes: .B or .S -128 to +127 bytes, .W or .L -32768 to +32767 bytes
4	Assembler automatically uses A, I, Q or M form if possible. Use #n.L to prevent Quick optimization

SSP	Supervisor Stack Pointer (32-bit)
USP	User Stack Pointer (32-bit)
SP	Active Stack Pointer (same as A7)
PC	Program Counter (24-bit)
SR	Status Register (16-bit)
CCR	Condition Code Register (lower 8-bits of SR)
	N negative, Z zero, V overflow, C carry, X extend
	* set according to operation's result, ≡ set directly
	- not affected, 0 cleared, 1 set, U undefined

Revised by Peter Csaszar, Lawrence Tech University – 2004-2006

Nom : .... Prénom : .... Classe : ....

DOCUMENT RÉPONSE À RENDRE

Exercice 1

Instruction	Mémoire	Registre
Exemple	$005000 54 AF **00 40** E7 21 48 C0	A0 = $00005004 A1 = $0000500C
Exemple	$005008 C9 10 11 C8 D4 36 **FF** 88	Aucun changement
MOVE.L #1024,-4(A1)	$005000 54 AF 18 B9 **00 00 04 00**	Aucun changement
MOVE.B $5008,-10(A0,D0.W)	$005000 54 AF 18 B9 E7 21 **C9** C0	Aucun changement
MOVE.L 2(A2),4(A2,D1.W)	$005000 54 AF **01 80 42 1A** 48 C0	Aucun changement
MOVE.B -1(A2),$E(A0,D2.L)	$005000 54 AF 18 B9 E7 21 48 **88**	Aucun changement

Exercice 2

Opération	Taille (bits)	Nombre manquant (hexadécimal)	N	Z	V	C
$1A + $?	8	**$E7**	0	0	0	1
$7FFF + $?	16	**$0000**	0	0	0	0
$7FFFFFFF + $?	32	**$80000000**	1	0	0	0

Exercice 3

Valeurs des registres après exécution du programme. **Utilisez la représentation hexadécimale sur 32 bits.**	
D1 = $00000001	**D3** = $00000001
D2 = $00001111	**D4** = $00005679

Exercice 4

```
IsBlank          cmpi.b  #' ',d1
                 beq     \blank

                 cmpi.b  #9,d1
                 beq     \blank

\not_blank       moveq.l #1,d0
                 rts

\blank           moveq.l #0,d0
                 rts
```

```
BlankCount       movem.l d1/d2/a0,-(a7)

                 clr.l   d2

\loop            move.b  (a0)+,d1
                 beq     \quit

                 jsr     IsBlank
                 tst.l   d0
                 bne     \loop

                 addq.l  #1,d2
                 bra     \loop

\quit            move.l  d2,d0
                 movem.l (a7)+,d1/d2/a0
                 rts
```

```
BlankToUnderscore movem.l d0/d1/a0,-(a7)

\loop            move.b  (a0)+,d1
                 beq     \quit

                 jsr     IsBlank
                 tst.l   d0
                 bne     \loop

                 move.b  #'_',-1(a0)
                 bra     \loop

\quit            movem.l (a7)+,d0/d1/a0
                 rts
```