# PROGRAM:

**IMMEDIATE ADDRESSING MODE : WITHOUT CARRY:**

| **LABEL** | **MNEMONICS** | **COMMENT** |
| --- | --- | --- |
|  | ldp #100h | Load the data pointer to point to the page number. [ 100h= 256 implies the 255th page] |
|  | Lacc #1234h | Load accumulator with input 1234h. |
|  | add #5678h | Add the input 5678h with the content of accumulator and store the result in accumulator. |
|  | Bcnd loop,c | Branch conditionally to loop if there is carry. |
|  | Sacl 00 | Store the value in accumulator (sum) in memory location 8000h. |
|  | Lacc #0000 | Load accumulator with 0000 value. |
|  | Sacl 01 | Store the value in accumulator (carry) in memory location 8001h. |
|  | B Loop1 | Branch unconditionally to loop1. |
| loop | Sacl 02 | Store the value in accumulator (sum) in memory location 8002h. |
|  | Lacc #0001 | Load accumulator with 0001 value. |
|  | Sacl 03 | Store the value in accumulator (carry) in memory location 8003h. |
| Loop1 | B Loop1 | Infinite loop to end the program. |

# IMMEDIATE ADDRESSING MODE : WITH CARRY:

| **LABEL** | **MNEMONICS** | **COMMENT** |
| --- | --- | --- |
|  | ldp #100h | Load the data pointer to point to the page number. [ 100h= 256 implies the 255th page] |
|  | Lacc #0bcdeh | Load accumulator with input 0bcde. |
|  | add #5234h | Add the input 5234h with the content of accumulator and store the result in accumulator. |
|  | Bcnd loop,c | Branch conditionally to loop if there is carry. |
|  | Sacl 00 | Store the value in accumulator (sum) in memory location 8000h. |
|  | Lacc #0000 | Load accumulator with immediate data(0000h) |
|  | Sacl 01 | Store the value in accumulator (carry) in memory location 8001h. |
|  | B Loop1 | Branch unconditionally to loop1. |
| loop | Sacl 02 | Store the value in accumulator (sum) in memory location 8002h. |
|  | Lacc #0001 | Load accumulator with immediate data(0001h) |
|  | Sacl 03 | Store the value in accumulator (carry) in memory location 8003h. |
| Loop1 | B Loop1 | Infinite loop to end the program. |

**DIRECT ADDRESSING MODE:**

| **LABEL** | **MNEMONICS** | **COMMENT** |
| --- | --- | --- |
|  | ldp #100h | Load the data pointer to point to the page number. [ 100h= 256 implies the 255th page] |
|  | Lacc 00h | Load the accumulator with contents of memory location 8000h |
|  | Add 01h | Add content of memory location 8001h  to the accumulator content and store the result in accumulator. |
|  | bcnd Loop,c | Branch conditionally to loop if there is carry |
|  | sacl 02 | Store the content of the accumulator (sum) in memory location 8002h |
|  | Lacc #00h | Load accumulator with immediate data(0000h) |
|  | sacl 03h | Store the content of accumulator (carry) in memory location 8003h. |
|  | b loop1 | Branch unconditionally to loop1 |
| loop | Sacl 02h | Store the content of the accumulator (sum) in memory location 8002h |
|  | Lacc #01h | Load accumulator with immediate data(0001h) |
|  | Sacl 03h | Store the content of accumulator (carry) in memory location 8003h |
| Loop1 | B loop1 | Infinite loop to end program. |

# INDIRECT ADDRESSING MODE:

| **LABEL** | **MNEMONICS** | **COMMENT** |
| --- | --- | --- |
|  | ldp #100h | Load the data pointer to point to the page number. [ 100h= 256 implies the 255th page] |
|  | lar ar0, #8000h | Load the auxillary register with ar0 pointing to block 8000h |
|  | mar \*, ar0 | Modify the auxillary register and make the pointer to ar0. |
|  | lacc \*+ | Load the accumulator with data pointed by the pointer 8000h and increment ar0 by 1 |
|  | add\*+ | Add the content of memory location 8001h with the content of accumulator and store the result in accumulator and increment ar0  by 1. |
|  | Bcnd loop,c | Branch conditionally to loop if there is carry |
|  | sacl\*+ | Store the content of accumulator (sum) in location 8002h and increment ar0 by 1. |
|  | Lacc #00h | Load accumulator with immediate data(0000h) |
|  | sacl\* | Store the content of accumulator (carry) in location 8003h. |
|  | B loop 1 | Branch unconditionally to loop1 |
| loop | sacl\*+ | Store the content of accumulator (sum) in location 8002h and increment ar0 by 1. |
|  | Lacc #01h | Load accumulator with immediate data(0001h) |
|  | sacl\* | Store the content of accumulator (carry) in location 8003h. |
| Loop1 | B loop1 | Infinite loop to end program. |

**OUTPUT:**

# IMMEDIATE ADDRESSING MODE : WITHOUT CARRY:

#GO C000

Executing....

Micro-50eb Serial Monitor, Ver-2.0 (c)1999, Vi Microsystems Pvt. Ltd., Chennai -96

#SD 8000

Substitute Data 8000:68AC- Substitute Data 8001:0000-

# WITH CARRY:

#GO C000

Executing....

Micro-50eb Serial Monitor, Ver-2.0 (c)1999, Vi Microsystems Pvt. Ltd., Chennai -96

#SD 8002

Substitute Data 8002:0F12- Substitute Data 8003:0001-

# DIRECT ADDRESSING MODE: WITHOUT CARRY:

#SD 8000

Substitute Data 8000:FE00-1234 Substitute Data 8001:D108-5678

#GO C000

Executing....

Micro-50eb Serial Monitor, Ver-2.0 (c)1999, Vi Microsystems Pvt. Ltd., Chennai -96

#SD 8002

Substitute Data 8002:68AC- Substitute Data 8003:0000

# WITH CARRY:

#SD 8000

Substitute Data 8000:FE00-5234

Substitute Data 8001:F508-BCDE #GO C000

Executing....

Micro-50eb Serial Monitor, Ver-2.0

#SD 8002

Substitute Data 8002:0F12-

Substitute Data 8003:0001

# INDIRECT ADDRESSING MODE: WITHOUT CARRY:

#SD 8000

Substitute Data 8000:FE00-1234 Substitute Data 8001:D108-5678

#GO C000

Executing....

Micro-50eb Serial Monitor, Ver-2.0 (c)1999, Vi Microsystems Pvt. Ltd., Chennai -96

#SD 8002

Substitute Data 8002:68AC- Substitute Data 8003:0000

# WITH CARRY:

#SD 8000

Substitute Data 8000:FE00-5234 Substitute Data 8001:F508-BCDE

#GO C000

Executing....

Micro-50eb Serial Monitor, Ver-2.0

#SD 8002

Substitute Data 8002:0F12- Substitute Data 8003:0001-

# PROGRAM:

**IMMEDIATE ADDRESSING MODE : WITHOUT BORROW:**

| **LABEL** | **MNEMONICS** | **COMMENT** |
| --- | --- | --- |
|  | ldp #100h | Load the data pointer to point to the page number. [ 100h= 256 implies the 255th page] |
|  | Lacc #0FFFFh | Load accumulator with input 0FFFFh. |
|  | Sub #0FFFEh | Subtract the input 0FFFEh with the content of accumulator and store the result in accumulator. |
|  | Bcnd loop,nc | Branch conditionally to loop if there is no carry. |
|  | Sacl 02 | Store the value in accumulator (difference) in memory location 8002h. |
|  | Lacc #0000 | Load accumulator with 0000 value. |
|  | Sacl 03 | Store the value in accumulator (borrow) in memory location 8003h. |
|  | B Loop1 | Branch unconditionally to loop1. |
| loop | Sacl 02 | Store the value in accumulator (difference) in memory location 8002h. |
|  | Lacc #0001 | Load accumulator with 0001 value. |
|  | Sacl 03 | Store the value in accumulator (borrow) in memory location 8003h. |
| Loop1 | B Loop1 | Infinite loop to end the program. |

# IMMEDIATE ADDRESSING MODE : WITH BORROW:

| **LABEL** | **MNEMONICS** | **COMMENT** |
| --- | --- | --- |
|  | ldp #100h | Load the data pointer to point to the page number. [ 100h= 256 implies the 255th page] |
|  | Lacc #0FFFEh | Load accumulator with input 0FFFEh. |
|  | Sub #0FFFFh | Subtract the input 0FFFFh with the content of accumulator and store the result in accumulator. |
|  | Bcnd loop,nc | Branch conditionally to loop if there is no carry. |
|  | Sacl 00 | Store the value in accumulator (difference) in memory location 8002h. |
|  | Lacc #0000 | Load accumulator with immediate data(0000h) |
|  | Sacl 01 | Store the value in accumulator (borrow) in memory location 8003h. |
|  | B Loop1 | Branch unconditionally to loop1. |
| loop | Sacl 02 | Store the value in accumulator (difference) in memory location 8002h. |
|  | Lacc #0001 | Load accumulator with immediate data(0001h) |
|  | Sacl 03 | Store the value in accumulator (borrow) in memory location 8003h. |
| Loop1 | B Loop1 | Infinite loop to end the program. |

**DIRECT ADDRESSING MODE:**

| **LABEL** | **MNEMONICS** | **COMMENT** |
| --- | --- | --- |
|  | ldp #100h | Load the data pointer to point to the page number. [ 100h= 256 implies the 255th page] |
|  | Lacc 00h | Load the accumulator with contents of memory location 8000h |
|  | sub 01h | Subtract content of memory location 8001h  to the accumulator content and store the result in accumulator. |
|  | bcnd Loop,nc | Branch conditionally to loop if there is no carry |
|  | sacl 02 | Store the content of the accumulator (difference) in memory location 8002h |
|  | Lacc #00h | Load accumulator with immediate data(0000h) |
|  | sacl 03h | Store the content of accumulator (borrow) in memory location 8003h. |
|  | b loop1 | Branch unconditionally to loop1 |
| loop | Sacl 02h | Store the content of the accumulator (difference) in memory location 8002h |
|  | Lacc #01h | Load accumulator with immediate data(0001h) |
|  | Sacl 03h | Store the content of accumulator (borrow) in memory location 8003h |
| Loop1 | B loop1 | Infinite loop to end program. |

# INDIRECT ADDRESSING MODE:

| **LABEL** | **MNEMONICS** | **COMMENT** |
| --- | --- | --- |
|  | ldp #100h | Load the data pointer to point to the page number. [ 100h= 256 implies the 255th page] |
|  | lar ar0, #8000h | Load the auxillary register with ar0 pointing to block 8000h |
|  | mar \*, ar0 | Modify the auxillary register and make the pointer to ar0. |
|  | lacc \*+ | Load the accumulator with data pointed by the pointer 8000h and increment ar0 by 1 |
|  | sub\*+ | subtract the content of memory location 8001h with the content of accumulator and store the result in accumulator and increment ar0  by 1. |
|  | Bcnd loop,nc | Branch conditionally to loop if there is no carry |
|  | sacl\*+ | Store the content of accumulator (sum) in location 8002h and increment ar0 by 1. |
|  | Lacc #00h | Load accumulator with immediate data(0000h) |
|  | sacl\* | Store the content of accumulator (carry) in location 8003h. |
|  | B loop1 | Branch unconditionally to loop1 |
| loop | sacl\*+ | Store the content of accumulator (sum) in location 8002h and increment ar0 by 1. |
|  | Lacc #01h | Load accumulator with immediate data(0001h) |
|  | sacl\* | Store the content of accumulator (carry) in location 8003h. |
| Loop1 | B loop1 | Infinite loop to end program. |

**OUTPUT:**

# IMMEDIATE ADDRESSING MODE : WITHOUT BORROW:

#GO C000

Executing....

Micro-50eb Serial Monitor, Ver-2.0 (c)1999, Vi Microsystems Pvt. Ltd., Chennai -96

#SD 8002

Substitute Data 8002:0001-

Substitute Data 8003:0000-

# WITH BORROW:

#GO C000

Executing....

Micro-50eb Serial Monitor, Ver-2.0 (c)1999, Vi Microsystems Pvt. Ltd., Chennai -96

#SD 8002

Substitute Data 8002:FFFF- Substitute Data 8003:0001-

# DIRECT ADDRESSING MODE: WITHOUT BORROW:

#SD 8000

Substitute Data 8000:FE00-FFFF Substitute Data 8001:D908-FFFE

#GO C000

Executing....

Micro-50eb Serial Monitor, Ver-2.0

(c)1999, Vi Microsystems Pvt. Ltd., Chennai -96 #SD 8002

Substitute Data 8002:0001-

Substitute Data 8003:0000-

# WITH BORROW:

#SD 8000

Substitute Data 8000:FFFF-FFFE Substitute Data 8001:FFFE-FFFF

#GO C000

Executing....

Micro-50eb Serial Monitor, Ver-2.0 (c)1999, Vi Microsystems Pvt. Ltd., Chennai -96

#SD 8002

Substitute Data 8002:FFFF- Substitute Data 8003:0001-

# INDIRECT ADDRESSING MODE: WITHOUT BORROW:

#SD 8000

Substitute Data 8000:FE00-FFFF Substitute Data 8001:D908-FFFE

#GO C000

Executing....

Micro-50eb Serial Monitor, Ver-2.0 #SD 8002

Substitute Data 8002:0001-

Substitute Data 8003:0000-

# WITH BORROW:

#SD 8000

Substitute Data 8000:FFFF-FFFE Substitute Data 8001:FFFE-FFFF

#GO C000

Executing....

Micro-50eb Serial Monitor, Ver-2.0

#SD 8002

Substitute Data 8002:FFFF- Substitute Data 8003:0001-

# PROGRAM:

| **LABEL** | **MNEMONICS** | **COMMENT** |
| --- | --- | --- |
|  | ldp #100h | Load the data pointer to point to the page number. [ 100h= 256 implies the 255th page] |
|  | Lt 00 | Load the product register with values in 8000h memory location |
|  | Mpyu 01 | Multiply the contents of product register with contents of 8001h memory location and result is stored in product register. |
|  | pac | Move the contents in product register to the accumulator. |
|  | Sacl 02 | Store the content in lower accumulator in 8002h memory location |
|  | Sach 03 | Store the content in higher accumulator in 8003h memory location |
| loop | b loop | Infinite loop to end the program. |

**OUTPUT:**

#SD 8000

Substitute Data 8000:0009-1234

Substitute Data 8001:0004-5678

Substitute Data 8002:0024-

Micro-50eb Serial Monitor, Ver-2.0 (c)1999, Vi Microsystems Pvt. Ltd., Chennai -96

#GO C000

Executing....

Micro-50eb Serial Monitor, Ver-2.0

(c)1999, Vi Microsystems Pvt. Ltd., Chennai -96 #SD 8000

Substitute Data 8000:1234-

Substitute Data 8001:5678-

Substitute Data 8002:0060-

Substitute Data 8003:0626-

# PROGRAM:

| **LABEL** | **MNEMONICS** | **COMMENT** |
| --- | --- | --- |
|  | ldp #100h | Load the data pointer to point to the page number. [ 100h= 256 implies the 255th page] |
|  | lar ar0, #8000h | Load the auxillary register with ar0 pointing to block 8000h |
|  | lar ar1, #8100h | Load the auxillary register with ar1 pointing to block 8100h . |
|  | lar ar2,#8200h | Load the auxillary register with ar2 pointing to block 8200h . |
|  | lar ar3, #06h | Load the value of 6 for count value and let ar3 point to it. |
|  | mar \*, ar0 | Modify the auxillary register and make the pointer to ar0. |
|  | lacc #0c100h | Load the accumulator with the value c100h indicating program memory. |
|  | rpt #04h | Repeat the next command (4+1) times |
|  | Tblw\*+ | Move data memory values to program memory (c100) values And increment position |
|  | lar ar1, #8103h | Load the auxillary register with ar1 pointing to block 8103h . |
|  | mar \*, ar1 | Modify the auxillary register and make the pointer to ar1. |
| loop | zap | clear the accumulator and product register contents. |
|  | rpt #04h | Repeat the next command (4+1) times. |
|  | mac 0c100h,\*- | The contents of accumulator and product register are added and result is stored In accumulator .The values in program memory is multiplied with data memory values and result is stored in product register. Position of program memory is incremented and position of data memory is decremented. |
|  | mar \*, ar2 | Modify the Auxillary register and make the pointer to ar2. |
|  | sacl\*+,ar1 | Store the content of accumulator in ar2[8200h] and increment position. Change pointer to ar1. |
|  | adrk #06h | Add Immediate constant value 06 to auxillary register ar1 to point next value of data memory. |
|  | mar \*, ar3 | Modify the auxillary register and make the pointer to ar3. |
|  | banz Loop,ar1 | Branch on no zero of auxillary register ar3 that refers to output count and change pointer to ar1 and decrement ar3 by 1. |
| Loop1 | b loop | Infinite loop to end program. |

**OUTPUT:**

#SD 8000

Substitute Data 8000:000A-1 Substitute Data 8001:000B-2 Substitute Data 8002:000C-3

Substitute Data 8003:000D-4 #SD 8100

Substitute Data 8100:0002-0

Substitute Data 8101:0001-0

Substitute Data 8102:0002-0

Substitute Data 8103:0001-2

Substitute Data 8104:0002-1

Substitute Data 8105:0001-2

Substitute Data 8106:0000-1

Substitute Data 8107:0000-0

Substitute Data 8108:0000-0

Substitute Data 8109:0000-0 #GO C000

Executing....

Micro-50eb Serial Monitor, Ver-2.0

(c)1999, Vi Microsystems Pvt. Ltd., Chennai -96 #SD 8200

Substitute Data 8200:0002-

Substitute Data 8201:0005- Substitute Data 8202:000A- Substitute Data 8203:0010- Substitute Data 8204:000C- Substitute Data 8205:000B- Substitute Data 8206:0004-

# PROGRAM:

| **LABEL** | **MNEMONICS** | **COMMENT** |
| --- | --- | --- |
|  | ldp #100h | Load the data pointer to point to the page number. [ 100h= 256 implies the 255th page] |
|  | lar ar0, #8000h | Load the auxillary register with ar0 pointing to block 8000h |
|  | lar ar1, #9000h | Load the auxillary register with ar1 pointing to block 9000h . |
|  | lar ar2, #05h | Load the value of 5 for count value and let ar2 point to it. |
|  | mar \*, ar1 | Modify the auxillary register and make the pointer to ar1. |
| loop1 | lacc\*,ar0 | Load the accumulator with the value pointed by ar1[9000h]. Change pointer to ar0. |
|  | exar | Exchange data of accumulator to accumulator buffer. |
|  | lacc\*,ar1 | Load accumulator with value of 8000h and Change pointer to ar1. |
|  | sacl\*+,ar0 | Store content of accumulator in ar1[9000h] and increment position. Change pointer to ar0. |
|  | lacb | Load the accumulator buffer contents. |
|  | sacl\*+,ar2 | Store the content of accumulator in ar0[8000h] and increment position. Now ar2 is pointed at. |
|  | banz loop1,ar1 | Branch on no zero of auxillary register ar2 that refers to the count value and change pointer to ar1 and decrement ar2 by 1 |
| loop | b loop | Infinite loop to end program. |

**OUTPUT:**

#SD 8000

Substitute Data 8000:0003-1 Substitute Data 8001:ABCF-2 Substitute Data 8002:B903-3 Substitute Data 8003:9899-4

Substitute Data 8004:5555-5

#SD 8100

Substitute Data 8100:000A- Substitute Data 8101:000B- Substitute Data 8102:000C- Substitute Data 8103:000D-

Substitute Data 8104:000E- #GO C000

Executing....

Micro-50eb Serial Monitor, Ver-2.0 (c)1999, Vi Microsystems Pvt. Ltd., Chennai -96

#SD 8000

Substitute Data 8000:000A- Substitute Data 8001:000B- Substitute Data 8002:000C- Substitute Data 8003:000D-

Substitute Data 8004:000E- #SD 8100

Substitute Data 8100:0001-

Substitute Data 8101:0002-

Substitute Data 8102:0003-

Substitute Data 8103:0004-

Substitute Data 8104:0005-

# SQUARE WAVE: PROGRAM:

| **LABEL** | **MNEMONICS** | **COMMENT** |
| --- | --- | --- |
|  | ldp #100h | Load the data pointer to point to the page number. [ 100h= 256 implies the 255th page] |
|  | Lacc #0000h | Load the accumulator with 0000 value |
| Loop | Sacl 00 | Store the value in accumulator in 8000h memory location |
|  | Rpt #0fffh | Repeat the next command for the given time value. |
|  | Out 00,04 | Display the output of 00 fro 04 .Port Address of DAC is 04 |
|  | cmpl | Complement the zero value to obtain maximum value of square wave. |
|  | b loop | Branch unconditionally to loop to repeat the sequence. |

**SAWTOOTH WAVEFORM: PROGRAM:**

| **LABEL** | **MNEMONICS** | **COMMENT** |
| --- | --- | --- |
|  | ldp #100h | Load the data pointer to point to the page number. [ 100h= 256 implies the 255th page] |
| Loop1 | Lacc #0000h | Load the accumulator with 0000 value |
|  | Sacl 00 | Store the value in accumulator in 8000h memory location |
| loop | Lacc 00 | Load the accumulator with value in 8000h |
|  | Out 00,04 | Display the output of 00 from 04.Port Address of DAC is 04 |
|  | Add #05 | Add the immediate value 05 with data in accumulator to obtain increasing slope and the result is stored in accumulator. |
|  | Sacl 00 | Store the value in accumulator in 8000h memory location. |
|  | Sub #0ffffh | Subtract the immediate value FFFFh with data in accumulator and the result is stored in accumulator. |
|  | Bcnd loop,leq | Branch conditionally to loop if the value in accumulator is less than zero |
|  | B loop1 | Branch unconditionally to loop 1 to repeat the process |

# TRIANGULAR WAVEFORM: PROGRAM:

| **LABEL** | **MNEMONICS** | **COMMENT** |
| --- | --- | --- |
|  | ldp #100h | Load the data pointer to point to the page number. [ 100h= 256 implies the 255th page] |
| START | Lacc #0000h | Load the accumulator with 0000 value |
|  | Sacl 01 | Store the value in accumulator in 8001h memory location. |
| loop | Lacc 01 | Load the accumulator with value in 8001h |
|  | Out 01,04 | Display the output of 01 from 04.Port Address of DAC is 04 |
|  | Add #05 | Add the immediate value 05 with data in accumulator to obtain increasing slope and the result is stored in accumulator. |
|  | Sacl 01 | Store the value in accumulator in 8001h memory location. |
|  | Sub #0ffffh | Subtract the immediate value 0ffff with data in accumulator and the result is stored in accumulator. |
|  | Bcnd loop,leq | Branch conditionally if the value in accumulator is less than zero |
|  | Lacc #0ffffh | Load the accumulator with 0ffff value |
| Loop1 | Sub #05 | Subtract the immediate value 05 with data in accumulator to obtain decreasing slope and the result is stored in accumulator. |
|  | Sacl 00 | Store the value in accumulator in 8000h memory location. |
|  | Out 00,04 | Display the output of 00 from 04.Port Address of DAC is 04 |
|  | Bcnd loop1,gt | Branch conditionally to loop 1 if the value in accumulator is greater than zero |
|  | B start loop1 | Branch unconditionally to START to repeat the process |

**OUTPUT(WAVEFORM GENERATION):**

#GO C000

Executing....

Micro-50eb Serial Monitor, Ver-2.0 (c)1999, Vi Microsystems Pvt. Ltd., Chennai -96