Ασκηση 4

Τμημα Α5

Συνεργατες:

Αλεξιος Λαζανας 1100605

Σταματια Καλημερη 1103080

ΚΑΤΑΧΩΡΗΤΕΣ

SP:1111

BR:1110

LR:1101

X:1100

PC:1011

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| **Mapper** | | |
| Κώδικας εντολής | Opcode/Θέση | Περιεχόμενα |
| LΟΑDSP #Υ **#K** | **00H** |  |
| LΟΑDLR #Υ : | **01H** |  |
| LΟΑDBR #Υ : | **02H** |  |
| PUSH $K | **03H** |  |
| POP $K | **04H** |  |
| ADD | **05H** |  |
| SUB | **06H** |  |
| HALT | **07H** |  |

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| **Main Memory** | | |
| Κώδικας εντολής | Θέση | Περιεχόμενο |
| LDRBR | 00H |  |
|  | 01H | **1001** |
| LDRSP | 02H |  |
|  | 03 | **1010** |
| LDLR | 04 |  |
|  | 05 | **0000** |
| PUSH | 06 |  |
|  | 07 | **13** |
| PUSH | 08 |  |
|  | 09 | **14** |
| ADD | 0A |  |
| PUSH | 0B |  |
|  | 0C | **15** |
| SUB | 0D |  |
|  | 0E |  |
| POP | 0F |  |
|  | 10 | **16** |
| HALT | 11 |  |
|  | 12 |  |
|  | 13 | **A** |
|  | 14 | **B** |
|  | 15 | **9** |

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| **BOOTSTRAP** | BRA | BIN | CON | I | I | I | APORT | BPORT | DDATA | SH~ | SELB | MWE~ | MARCLK | MSTATUS | LDS~ | PCE~ | CARRYE~ | MDE~ | DDATAE~ | **ADDRESS** |
|  | (4:0) | (2:0) | (2:0) | (2:0) | (5:3) | (8:6) | (3:0) | (3:0) | (1:0) |  |  |  |  |  |  |  |  |  |  |  |
| SW+0->PC,MAR | xxxxx | 000 | χχχ | 111 | 000 | 011 | χχχχ | 0001 | χχ | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 1 | m00 |
| NEXT(PC) | xxxxx | 000 | χχχ | χχχ | χχχ | 001 | χχχχ | χχχχ | χχ | χ | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | m01 |

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| **LDSP #K** | BRA | BIN | CON | I | I | I | APORT | BPORT | DDATA | SH~ | SELB | MWE~ | MARCLK | MSTATUS | LDS~ | PCE~ | CARRYE~ | MDE~ | DDATAE~ | **ADDRESS** |
|  | (4:0) | (2:0) | (2:0) | (2:0) | (5:3) | (8:6) | (3:0) | (3:0) | (1:0) |  |  |  |  |  |  |  |  |  |  |  |
| PC+1->PC,MAR | xxxxx | 000 | χχχ | 101 | 000 | 011 | 1011 | 1011 | 01 | Χ | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 0 | m08 |
| MDR+0->SP | xxxxx | 000 | χχχ | 111 | 000 | 011 | χχχχ | 1111 | χχ | Χ | 1 | 1 | 0 | 0 | 1 | 1 | 1 | 0 | 1 | m07 |
| PC+1->PC,MAR | xxxxx | 000 | χχχ | 101 | 000 | 011 | 1011 | 1011 | 01 | Χ | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 0 | m08 |
| NEXT(PC) | xxxxx | 000 | χχχ | χχχ | χχχ | 001 | χχχχ | χχχχ | χχ | χ | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | m09 |

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| **LDLR #K** | BRA | BIN | CON | I | I | I | APORT | BPORT | DDATA | SH~ | SELB | MWE~ | MARCLK | MSTATUS | LDS~ | PCE~ | CARRYE~ | MDE~ | DDATAE~ | **ADDRESS** |
|  | (4:0) | (2:0) | (2:0) | (2:0) | (5:3) | (8:6) | (3:0) | (3:0) | (1:0) |  |  |  |  |  |  |  |  |  |  |  |
| PC+1->PC,MAR | xxxxx | 000 | χχχ | 101 | 000 | 011 | 1011 | 1011 | 01 | Χ | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 0 | m08 |
| MDR+0->LR | xxxxx | 000 | χχχ | 111 | 000 | 011 | χχχχ | 1101 | χχ | Χ | 1 | 1 | 0 | 0 | 1 | 1 | 1 | 0 | 1 | m07 |
| PC+1->PC,MAR | xxxxx | 000 | χχχ | 101 | 000 | 011 | 1011 | 1011 | 01 | Χ | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 0 | m08 |
| NEXT(PC) | xxxxx | 000 | χχχ | χχχ | χχχ | 001 | χχχχ | χχχχ | χχ | χ | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | m09 |

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| **LDBR #K** | BRA | BIN | CON | I | I | I | APORT | BPORT | DDATA | SH~ | SELB | MWE~ | MARCLK | MSTATUS | LDS~ | PCE~ | CARRYE~ | MDE~ | DDATAE~ | **ADDRESS** |
|  | (4:0) | (2:0) | (2:0) | (2:0) | (5:3) | (8:6) | (3:0) | (3:0) | (1:0) |  |  |  |  |  |  |  |  |  |  |  |
| PC+1->PC,MAR | xxxxx | 000 | χχχ | 101 | 000 | 011 | 1011 | 1011 | 01 | Χ | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 0 | m08 |
| MDR+0->BR | xxxxx | 000 | χχχ | 111 | 000 | 011 | χχχχ | 1110 | χχ | Χ | 1 | 1 | 0 | 0 | 1 | 1 | 1 | 0 | 1 | m07 |
| PC+1->PC,MAR | xxxxx | 000 | χχχ | 101 | 000 | 011 | 1011 | 1011 | 01 | Χ | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 0 | m08 |
| NEXT(PC) | xxxxx | 000 | χχχ | χχχ | χχχ | 001 | χχχχ | χχχχ | χχ | χ | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | m09 |

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| PUSH $K | BRA | BIN | CON | I | I | I | APORT | BPORT | DDATA | SH~ | SELB | MWE~ | MARCLK | MSTATUS | LDS~ | PCE~ | CARRYE~ | MDE~ | DDATAE~ | **ADDRESS** |
|  | (4:0) | (2:0) | (2:0) | (2:0) | (5:3) | (8:6) | (3:0) | (3:0) | (1:0) |  |  |  |  |  |  |  |  |  |  |  |
| PC+1->PC,MAR | xxxxx | 000 | χχχ | 101 | 000 | 011 | 1011 | 1011 | 01 | Χ | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 0 | m08 |
| MDR+0-> X | xxxxx | 000 | χχχ | 111 | 000 | 011 | χχχχ | 1100 | χχ | Χ | 1 | 1 | 0 | 0 | 1 | 1 | 1 | 0 | 1 | m0B |
| X+0->NOP,MAR | xxxxx | 000 | χχχ | 100 | 000 | 001 | 1100 | χχχχ | χχ | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 1 | m0C |
| SP-BR->FB ! | XXXXX | 000 | XXX | 101 | 001 | 011 | 1111 | 1110 | XX | 1 | 0 | 1 | 0 | 1 | 1 | 1 | 1 | 0 | 1 | m10 |
| BRZ,0011 | 00011 | 011 | 011 | xxx | xxx | xxx | χχχχ | xxxx | χχ | Χ | x | x | x | x | x | x | x | x | x | m1C |
| SP-1->SP | xxxxx | 000 | χχχ | 101 | 001 | 011 | 1111 | 1111 | 01 | Χ | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 0 | m0F |
| MDR+0-> FB | xxxxx | 000 | χχχ | 111 | 000 | 011 | χχχχ | xxxx | χχ | Χ | 0 | 1 | 0 | 0 | 1 | 1 | 1 | 0 | 1 | m0B |
| PC+1->PC,MAR | xxxxx | 000 | χχχ | 101 | 000 | 011 | 1011 | 1011 | 01 | Χ | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 0 | m08 |
| NEXT(PC) | xxxxx | 000 | χχχ | χχχ | χχχ | 001 | χχχχ | χχχχ | χχ | χ | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | m11 |

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| **POP $K** | BRA | BIN | CON | I | I | I | APORT | BPORT | DDATA | SH~ | SELB | MWE~ | MARCLK | MSTATUS | LDS~ | PCE~ | CARRYE~ | MDE~ | DDATAE~ | **ADDRESS** |
|  | (4:0) | (2:0) | (2:0) | (2:0) | (5:3) | (8:6) | (3:0) | (3:0) | (1:0) |  |  |  |  |  |  |  |  |  |  |  |
| PC+1->PC,MAR | xxxxx | 000 | χχχ | 101 | 000 | 011 | 1011 | 1011 | 01 | Χ | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 0 | m08 |
| MDR+0-> X | xxxxx | 000 | χχχ | 111 | 000 | 011 | χχχχ | 1100 | χχ | Χ | 1 | 1 | 0 | 0 | 1 | 1 | 1 | 0 | 1 | m0B |
| X+0->NOP,MAR | xxxxx | 000 | χχχ | 100 | 000 | 001 | 1100 | χχχχ | χχ | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 1 | m0C |
| SP-BR->FB ! | XXXXX | 000 | XXX | 101 | 001 | 011 | 1111 | 1110 | XX | 1 | 0 | 1 | 0 | 1 | 1 | 1 | 1 | 0 | 1 | m10 |
| BRZ,0011 | 00011 | 011 | 011 | xxx | xxx | xxx | χχχχ | xxxx | χχ | Χ | x | x | x | x | x | x | x | x | x | m1C |
| SP+1->SP | xxxxx | 000 | χχχ | 101 | 000 | 011 | 1111 | 1111 | 01 | Χ | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 0 | m0F |
| MDR+0-> FB | xxxxx | 000 | χχχ | 111 | 000 | 011 | χχχχ | xxxx | χχ | Χ | 0 | 1 | 0 | 0 | 1 | 1 | 1 | 0 | 1 | m0B |
| PC+1->PC,MAR | xxxxx | 000 | χχχ | 101 | 000 | 011 | 1011 | 1011 | 01 | Χ | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 0 | m08 |
| NEXT(PC) | xxxxx | 000 | χχχ | χχχ | χχχ | 001 | χχχχ | χχχχ | χχ | χ | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | m11 |

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| **SUB** | BRA | BIN | CON | I | I | I | APORT | BPORT | DDATA | SH~ | SELB | MWE~ | MARCLK | MSTATUS | LDS~ | PCE~ | CARRYE~ | MDE~ | DDATAE~ | **ADDRESS** |
|  | (4:0) | (2:0) | (2:0) | (2:0) | (5:3) | (8:6) | (3:0) | (3:0) | (1:0) |  |  |  |  |  |  |  |  |  |  |  |
| BR-SP->FB | XXXXX | 000 | XXX | 001 | 001 | 001 | 1110 | 1111 | XX | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 0 | 1 | m10 |
| BRN 1000 | 01000 | 011 | 010 | xxx | xxx | xxx | χχχχ | xxxx | χχ | Χ | x | x | x | x | x | x | x | x | x | m0B |
| sp+0->sp | xxxxx | 000 | χχχ | 100 | 000 | 011 | 1111 | 1111 | XX | Χ | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | X | m0F |
| fr+0->q | xxxxx | 000 | χχχ | 011 | 000 | 001 | xxxx | 1100 | XX | Χ | 0 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | X | m0F |
| q+0->x | xxxxx | 000 | χχχ | 010 | 000 | 011 | xxxx | 1100 | XX | Χ | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | X | m0F |
| sp+1->sp | xxxxx | 000 | χχχ | 101 | 000 | 011 | 1100 | 1100 | 01 | Χ | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 0 | m0F |
| fr+0->q | xxxxx | 000 | χχχ | 011 | 000 | 001 | xxxx | xxxx | xx | Χ | 0 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | X | m0F |
| x-q->q | xxxxx | 000 | χχχ | 000 | 001 | 001 | 1100 | xxxx | XX | Χ | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | x | m0F |
| sp+0->sp | xxxxx | 000 | χχχ | 100 | 000 | 011 | 1111 | 1111 | XX | Χ | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | X | m0F |
| q+0->fr | xxxxx | 000 | χχχ | 010 | 000 | 001 | xxxx | xxxx | XX | Χ | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | X | m0F |
| pc+1->pc, mar | xxxxx | 000 | χχχ | 101 | 000 | 011 | 1011 | 1011 | 01 | Χ | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 0 | m08 |
| next(pc) | xxxxx | 000 | χχχ | χχχ | χχχ | 001 | χχχχ | χχχχ | χχ | χ | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | m11 |

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| **ADD** | BRA | BIN | CON | I | I | I | APORT | BPORT | DDATA | SH~ | SELB | MWE~ | MARCLK | MSTATUS | LDS~ | PCE~ | CARRYE~ | MDE~ | DDATAE~ | **ADDRESS** |
|  | (4:0) | (2:0) | (2:0) | (2:0) | (5:3) | (8:6) | (3:0) | (3:0) | (1:0) |  |  |  |  |  |  |  |  |  |  |  |
| BR-SP->FB | XXXXX | 000 | XXX | 001 | 001 | 001 | 1110 | 1111 | XX | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 0 | 1 | m10 |
| BRN 1000 | 01000 | 011 | 010 | xxx | xxx | xxx | χχχχ | xxxx | χχ | Χ | x | x | x | x | x | x | x | x | x | m0B |
| sp+0->sp | xxxxx | 000 | χχχ | 100 | 000 | 011 | 1111 | 1111 | XX | Χ | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | X | m0F |
| fr+0->q | xxxxx | 000 | χχχ | 011 | 000 | 001 | xxxx | 1100 | XX | Χ | 0 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | X | m0F |
| q+0->x | xxxxx | 000 | χχχ | 010 | 000 | 011 | xxxx | 1100 | XX | Χ | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | X | m0F |
| sp+1->sp | xxxxx | 000 | χχχ | 101 | 000 | 011 | 1100 | 1100 | 01 | Χ | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 0 | m0F |
| fr+0->q | xxxxx | 000 | χχχ | 011 | 000 | 001 | xxxx | xxxx | xx | Χ | 0 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | X | m0F |
| x+q->q | xxxxx | 000 | χχχ | 000 | 000 | 001 | 1100 | xxxx | XX | Χ | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | x | m0F |
| sp+0->sp | xxxxx | 000 | χχχ | 100 | 000 | 011 | 1111 | 1111 | XX | Χ | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | X | m0F |
| q+0->fr | xxxxx | 000 | χχχ | 010 | 000 | 001 | xxxx | xxxx | XX | Χ | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | X | m0F |
| pc+1->pc, mar | xxxxx | 000 | χχχ | 101 | 000 | 011 | 1011 | 1011 | 01 | Χ | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 0 | m08 |
| next(pc) | xxxxx | 000 | χχχ | χχχ | χχχ | 001 | χχχχ | χχχχ | χχ | χ | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | m11 |

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| **HALT** | BRA | BIN | CON | I | I | I | APORT | BPORT | DDATA | SH~ | SELB | MWE~ | MARCLK | MSTATUS | LDS~ | PCE~ | CARRYE~ | MDE~ | DDATAE~ | **ADDRESS** |
|  | (4:0) | (2:0) | (2:0) | (2:0) | (5:3) | (8:6) | (3:0) | (3:0) | (1:0) |  |  |  |  |  |  |  |  |  |  |  |
| SW+0->PC,MAR | xxxxx | 000 | χχχ | 111 | 000 | 011 | χχχχ | 0000 | χχ | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 1 | m28 |
| NEXT(PC) | xxxxx | 000 | χχχ | χχχ | χχχ | 001 | χχχχ | χχχχ | χχ | χ | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | m29 |