Ασκηση 3

Τμημα Α5

Συνεργατες:

Αλεξιος Λαζανας 1100605

Σταματια Καλημερη 1103080

Καταχωρητες:

PC:0000

ACC:0010

X:0001

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| **Mapper** | | |
| Κώδικας εντολής | Opcode/Θέση | Περιεχόμενα |
| LDA K(Χ) | **00H** | 02H |
| LDX #Κ | **01H** | 08H |
| ΙΝΧ | **02H** | 0cH |
| CMPX #Κ | **03H** | 0fH |
| STA Κ(Χ) | **04H** | 13H |
| CRC | **06H** | 18H |
| JNZ $K | **07H** | 1bH |
| SHLA | **08H** | 25H |
| HALT | **09H** | 28H |
| ADC K(X) | **0AH** | 2aH |

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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 | 0000 | 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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| LDA K(X) | 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 | XXX | 101 | 000 | 011 | 0000 | 0000 | 0.1 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 0 | m02 |
| MDR+X->X | XXXXX | 000 | XXX | 101 | 000 | 011 | 0001 | 0001 | XX | 1 | 1 | 1 | 0 | 0 | 1 | 1 | 1 | 0 | 1 | m03 |
| X+0->NOP, MAR | XXXXX | 000 | XXX | 100 | 000 | 001 | 0001 | XXXX | XX | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 1 | m04 |
| MDR+0->ACC | XXXXX | 000 | XXX | 111 | 000 | 011 | XXXX | 0010 | XX | 1 | 1 | 1 | 0 | 0 | 1 | 1 | 1 | 0 | 1 | m05 |
| PC+1->PC, MAR | XXXXX | 000 | XXX | 101 | 000 | 011 | 0000 | 0000 | 01 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 0 | m06 |
| NEXT(PC) | xxxxx | 000 | χχχ | χχχ | χχχ | 001 | χχχχ | χχχχ | χχ | χ | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | m07 |

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| **LDX #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 | XXX | 101 | 000 | 011 | 0000 | 0000 | 01 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 0 | m08 |
| MDR+0->X | XXXXX | 000 | XXX | 111 | 000 | 011 | XXXX | 0001 | XX | 1 | 1 | 1 | 0 | 0 | 1 | 1 | 1 | 0 | 1 | m09 |
| PC+1->PC, MAR | XXXXX | 000 | XXX | 101 | 000 | 011 | 0000 | 0000 | 01 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 0 | m0A |
| NEXT(PC) | xxxxx | 000 | χχχ | χχχ | χχχ | 001 | χχχχ | χχχχ | χχ | χ | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | m0B |

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| **INX** | 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) |  |  |  |  |  |  |  |  |  |  |  |
| X+1->X | XXXXX | 000 | XXX | 101 | 000 | 011 | 0001 | 0001 | 01 | 1 | 1 | 1 | 0 | 0 | 1 | 1 | 1 | 1 | 0 | m0C |
| PC+1->PC, MAR | XXXXX | 000 | XXX | 101 | 000 | 011 | 0000 | 0000 | 01 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 0 | m0D |
| NEXT(PC) | xxxxx | 000 | χχχ | χχχ | χχχ | 001 | χχχχ | χχχχ | χχ | χ | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | m0E |

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| **CMPX #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 | 0000 | 0000 | 01 | Χ | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 0 | m0F |
| X-MDR->FR ! | XXXXX | 000 | XXX | 101 | 001 | 011 | 0010 | XXXX | XX | 1 | 0 | 1 | 0 | 1 | 1 | 1 | 1 | 0 | 1 | m10 |
| PC+1->PC, MAR | XXXXX | 000 | XXX | 101 | 000 | 011 | 0001 | 0001 | 01 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 0 | m11 |
| NEXT(PC) | XXXXX | 000 | XXX | XXX | XXX | 001 | XXXX | XXXX | XX | X | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | m12 |

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| **STA K(Χ)** | 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 | 0000 | 0000 | 01 | Χ | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 0 | m13 |
| X+MDR->NOP, MAR | XXXXX | 000 | XXX | 101 | 000 | 001 | 0001 | XXXX | XX | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 1 | m14 |
| ACC+0->NOP, MWE~ | XXXXX | 000 | XXX | 100 | 000 | 001 | 0010 | XXXX | XX | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 0 | m15 |
| PC+1->PC,MAR | xxxxx | 000 | χχχ | 101 | 000 | 011 | 0000 | 0000 | 01 | Χ | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 0 | m16 |
| NEXT(PC) | xxxxx | 000 | χχχ | χχχ | χχχ | 001 | χχχχ | χχχχ | χχ | χ | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | m17 |

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| **CRC** | 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) |  |  |  |  |  |  |  |  |  |  |  |
| X+0->X | XXXXX | 000 | XXX | 100 | 000 | 011 | 0001 | 0001 | XX | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | m18 |
| PC+1->PC, MAR | XXXXX | 000 | XXX | 101 | 000 | 011 | 0000 | 0000 | 0.1 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 0 | m19 |
| NEXT(PC) | xxxxx | 000 | χχχ | χχχ | χχχ | 001 | χχχχ | χχχχ | χχ | χ | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | m1A |

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| **JNZ $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 | 0000 | 0000 | 01 | Χ | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 0 | m1B |
| BRZ,0010(πηδα 2) | 00010 | 011 | 011 | xxx | xxx | xxx | χχχχ | xxxx | χχ | Χ | x | x | x | x | x | x | x | x | x | m1C |
| JMP,0011 | 00011 | 010 | χχχ | xxx | xxx | xxx | xxxx | xxxx | χχ | X | x | x | x | x | x | x | x | x | x | m1D |
| PC+1->PC,MAR | xxxxx | 000 | χχχ | 101 | 000 | 011 | 0000 | 0000 | 01 | Χ | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 0 | m1E |
| NEXT(PC) | xxxxx | 000 | χχχ | χχχ | χχχ | 001 | χχχχ | χχχχ | χχ | χ | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | m1F |
| MDR+0->ACC | xxxxx | 000 | χχχ | 111 | 000 | 011 | χχχχ | 0010 | χχ | Χ | 1 | 1 | 0 | 0 | 1 | 1 | 1 | 0 | 1 | m20 |
| ACC+0->NOP, MWE~ | XXXXX | 000 | XXX | 100 | 000 | 001 | 0010 | XXXX | XX | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 0 | m21 |
| MDR+0->ACC | xxxxx | 000 | χχχ | 111 | 000 | 011 | χχχχ | 0010 | χχ | Χ | 1 | 1 | 0 | 0 | 1 | 1 | 1 | 0 | 1 | m22 |
| PC+ACC->PC | xxxxx | 000 | χχχ | 001 | 000 | 011 | 0010 | 0000 | xx | Χ | 1 | 1 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | m23 |
| NEXT(PC) | xxxxx | 000 | χχχ | χχχ | χχχ | 001 | χχχχ | χχχχ | χχ | χ | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | m24 |

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| **SHLA** | 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) |  |  |  |  |  |  |  |  |  |  |  |
| ACC+0->ACC,SRMU | XXXXX | 0.00 | XXX | 100 | 000 | 111 | 0010 | XXXX | XX | 0 | 1 | 1 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | m25 |
| PC+1->PC,MAR | xxxxx | 000 | χχχ | 101 | 000 | 011 | 0000 | 0000 | 01 | Χ | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 0 | m26 |
| NEXT(PC) | xxxxx | 000 | χχχ | χχχ | χχχ | 001 | χχχχ | χχχχ | χχ | χ | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | m27 |

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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 |

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| **ADC K(X)** | 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 | 0000 | 0000 | 01 | Χ | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 0 | m2A |
| MDR+X->X | xxxxx | 000 | xxx | 111 | 000 | 011 | χχχχ | 0010 | χχ | Χ | 1 | 1 | 0 | 0 | 1 | 1 | 1 | 0 | 1 | m2B |
| X+0->X,MAR | xxxxx | 000 | xxx | 100 | 000 | 011 | 0001 | 0001 | XX | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | m2C |
| MDR+0->ACC | xxxxx | 000 | χχχ | 111 | 000 | 011 | χχχχ | 0010 | χχ | Χ | 1 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 1 | m2D |
| PC+1->PC,MAR | xxxxx | 000 | χχχ | 101 | 000 | 011 | 0000 | 0000 | 01 | Χ | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 0 | m2E |
| NEXT(PC) | xxxxx | 000 | χχχ | χχχ | χχχ | 001 | χχχχ | χχχχ | χχ | χ | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | m2F |