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** | 0aH |
| ΙΝΧ | **02H** | 0fH |
| CMPX #Κ | **03H** | 12H |
| STA Κ(Χ) | **04H** | 16H |
| ADC K(X) | **05H** | 2cH |
| CRC | **06H** | 1bH |
| JNZ $K | **07H** | 1EH |
| SHLA | **08H** | 27H |
| HALT | **09H** | 2aH |

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| **Main Memory** | | |
| Κώδικας εντολής | Θέση | Περιεχόμενο |
|  | 00H | **1H** |
|  | 01H | **4H** |
|  | 02H | 3H |
|  | 03 | **7H** |
|  | 04 | **5H** |
|  | 05 | **2H** |
|  | 06 | **1H** |
|  | 07 | **4H** |
|  | 08 | **5H** |
|  | 09 | **4H** |
|  | 0A | **4H** |
|  | 0B | **4H** |
|  | 0C | **7H** |
|  | 0D | **6H** |
|  | 0E | **5H** |
|  | 0F | **2H** |
| LDX #0 | 10 | **00H** |
|  | 11 | **0H** |
| LDA 0(X) | 12 | **01H** |
|  | 13 | **0H** |
| ADC 0(X) | 14 | **05H** |
|  | 15 | **0H** |
| ADC 1(X) | 16 | **05H** |
|  | 17 | **1H** |
| STA 32(x) | 18 | **04H** |
|  | 19 | **32H** |
| INX | 2A | **02H** |
| CMPX #7 | 2B | **03H** |
|  | 2C | **7H** |
| JNZ $10H | 2D | **07H** |
|  | 2E | **10H** |
| HALT | 2F | **09H** |

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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 | χχχ | 101 | 000 | 011 | 0000 | 0000 | 01 | Χ | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 0 | m03 |
| MDR+0->ACC | xxxxx | 000 | χχχ | 111 | 000 | 011 | χχχχ | 0010 | χχ | Χ | 1 | 1 | 0 | 0 | 1 | 1 | 1 | 0 | 1 | m04 |
| ACC+X->ACC | xxxxx | 000 | χχχ | 001 | 000 | 011 | 0010 | 0001 | χχ | X | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 1 | m05 |
| ACC+0->NOP,MAR | xxxxx | 000 | χχχ | 100 | 000 | 001 | 0010 | χχχχ | χχ | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 1 | 6 |
| MDR+0->ACC | xxxxx | 000 | χχχ | 111 | 000 | 011 | χχχχ | 0010 | χχ | Χ | 1 | 1 | 0 | 0 | 1 | 1 | 1 | 0 | 1 | 7 |
| PC+1->PC,MAR | xxxxx | 000 | χχχ | 101 | 000 | 011 | 0000 | 0000 | 01 | Χ | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 0 | 8 |
| 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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| **LDA #Κ** | 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 | m10 |
| MDR+0->ACC | xxxxx | 000 | χχχ | 111 | 000 | 011 | χχχχ | 0010 | χχ | Χ | 1 | 1 | 0 | 0 | 1 | 1 | 1 | 0 | 1 | m11 |
| PC+1->PC,MAR | xxxxx | 000 | χχχ | 101 | 000 | 011 | 0000 | 0000 | 01 | Χ | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 0 | m12 |
| NEXT(PC) | xxxxx | 000 | χχχ | χχχ | χχχ | 001 | χχχχ | χχχχ | χχ | χ | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | m14 |

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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 | m15 |
| PC+1->PC, MAR | XXXXX | 000 | XXX | 101 | 000 | 011 | 0000 | 0000 | 01 | 1 | 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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| **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 | m18 |
| X-MDR->FR ! | XXXXX | 000 | XXX | 101 | 001 | 011 | 0010 | XXXX | XX | 1 | 0 | 1 | 0 | 1 | 1 | 1 | 1 | 0 | 1 | m19 |
| PC+1->PC, MAR | XXXXX | 000 | XXX | 101 | 000 | 011 | 0001 | 0001 | 0.1 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 0 | m20 |
| NEXT(PC) | XXXXX | 0.00 | XXX | XXX | XXX | 001 | XXXX | XXXX | XX | X | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 21 |

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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 | m22 |
| X+MDR->NOP, MAR | XXXXX | 0.00 | XXX | 101 | 000 | 001 | 0001 | XXXX | XX | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 1 | m23 |
| ACC+0->NOP, MWE~ | XXXXX | 0.00 | XXX | 100 | 000 | 001 | 0010 | XXXX | XX | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 0 | m24 |
| PC+1->PC,MAR | xxxxx | 000 | χχχ | 101 | 000 | 011 | 0000 | 0000 | 01 | Χ | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 0 | m25 |
| NEXT(PC) | xxxxx | 000 | χχχ | χχχ | χχχ | 001 | χχχχ | χχχχ | χχ | χ | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | m26 |

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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 | m27 |
| PC+1->PC, MAR | XXXXX | 000 | XXX | 101 | 000 | 011 | 0000 | 0000 | 0.1 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 0 | 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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| **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 | m30 |
| BRZ,0010(πηδα 2) | 0010 | 011 | 011 | xxx | xxx | xxx | χχχχ | xxxx | χχ | Χ | x | x | x | x | x | x | x | x | x | m31 |
| JMP,0011 | 0011 | 010 | χχχ | xxx | xxx | xxx | xxxx | xxxx | χχ | X | x | x | x | x | x | x | x | x | x | m32 |
| PC+1->PC,MAR | xxxxx | 000 | χχχ | 101 | 000 | 011 | 0000 | 0000 | 01 | Χ | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 0 | m33 |
| NEXT(PC) | xxxxx | 000 | χχχ | χχχ | χχχ | 001 | χχχχ | χχχχ | χχ | χ | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | m34 |
| MDR+0->ACC | xxxxx | 000 | χχχ | 111 | 000 | 011 | χχχχ | 0010 | χχ | Χ | 1 | 1 | 0 | 0 | 1 | 1 | 1 | 0 | 1 | m35 |
| ACC+0->NOP, MWE~ | XXXXX | 0.00 | XXX | 100 | 000 | 001 | 0010 | XXXX | XX | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 0 | m36 |
| MDR+0->ACC | xxxxx | 000 | χχχ | 111 | 000 | 011 | χχχχ | 0010 | χχ | Χ | 1 | 1 | 0 | 0 | 1 | 1 | 1 | 0 | 1 | m37 |
| PC+ACC->PC | xxxxx | 000 | χχχ | 001 | 000 | 011 | 0010 | 0000 | xx | Χ | 1 | 1 | 0 | 0 | 1 | 1 | 1 | 1 | 1 |  |
| NEXT(PC) | xxxxx | 000 | χχχ | χχχ | χχχ | 001 | χχχχ | χχχχ | χχ | χ | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | m38 |

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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 | 39 |
| PC+1->PC,MAR | xxxxx | 000 | χχχ | 101 | 000 | 011 | 0000 | 0000 | 01 | Χ | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 0 | m40 |
| NEXT(PC) | xxxxx | 000 | χχχ | χχχ | χχχ | 001 | χχχχ | χχχχ | χχ | χ | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | m41 |

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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 | 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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| **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 | m30 |
| MDR+X->X | xxxxx | 000 | xxx | 111 | 000 | 011 | χχχχ | 0010 | χχ | Χ | 1 | 1 | 0 | 0 | 1 | 1 | 1 | 0 | 1 |  |
| X+0->X,MAR | xxxxx | 000 | xxx | 100 | 000 | 011 | 0001 | 0001 | XX | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | m27 |
| MDR+0->ACC | xxxxx | 000 | χχχ | 111 | 000 | 011 | χχχχ | 0010 | χχ | Χ | 1 | 1 | 0 | 0 | 1 | 1 | 1 | 0 | 1 | m37 |
| PC+1->PC,MAR | xxxxx | 000 | χχχ | 101 | 000 | 011 | 0000 | 0000 | 01 | Χ | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 0 | m30 |
| NEXT(PC) | xxxxx | 000 | χχχ | χχχ | χχχ | 001 | χχχχ | χχχχ | χχ | χ | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | m01 |