

ISTANBUL TECHNICAL

UNIVERSITY

COMPUTER ENGINEERING

COMPUTER ORGANIZATION

PROJECT #4 REPORT

**Group 42**

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|  |  |  |
| --- | --- | --- |
| F1 | Microoperation | Symbol |
| 0000 | None | NOP |
| 0001 | AC ←0 | CLRAC |
| 0010 | AC←AC+1 | INCAC |
| 0011 | AC←DR | DRTAC |
| 0100 | AC←AC’ | COMAC |
| 0101 | AC←cir AC | CIR |
| 0110 | AC←cil AC | CIL |
| 0111 | AC(0-7)←INPR | INPT |
| 1000 | OUTR←AC(0-7) | OUTPT |
| 1001 | AC ← AC + DR | ADD |
| 1010 | AC←AC /\ DR | AND |
| 1011 | DR←M[AR] | READ |
| 1100 | DR←DR+1 | INCDR |
| 1101 | PC←PC+1 | INCPC |
| 1110 | TR←PC | PCTTR |
| 1111 | PC←0 | CLRPC |

|  |  |  |
| --- | --- | --- |
| F2 | Microoperation | Symbol |
| 0000 | None | NOP |
| 0001 | M[AR]←DR | WRITE |
| 0010 | M[AR]←TR | WRITE2 |
| 0011 | E←0 | CLRE |
| 0100 | E←E’ | COME |
| 0101 | AR←M[AR] | INDR |
| 0110 | FGI←0 | CLFGI |
| 0111 | FGO←0 | CLFGO |
| 1000 | R←0 | CLRR |
| 1001 | S←0 | CLRS |
| 1010 | M[AR]←AC | WRITE3 |
| 1011 |  |  |
| 1100 |  |  |
| 1101 |  |  |
| 1110 |  |  |
| 1111 |  |  |

|  |  |  |
| --- | --- | --- |
| F3 | Microoperation | Symbol |
| 000 | None | NOP |
| 001 | IEN←0 | CLRIEN |
| 010 | IEN←1 | SETIEN |
| 011 | AR←0 | CLRAR |
| 100 | IR←M[PC] | RDINS |
| 101 | AR←IR(0-11) | IRTAR |
| 110 | PC←AR | ARTPC |
| 111 | AR←AR+1 | INCAR |

|  |  |  |
| --- | --- | --- |
| CD | Condition | Symbol |
| 000 | Always | U |
| 001 | IR(15)=1 | I |
| 010 | AC(15)=1 | ACS |
| 011 | AC=0 | ACZ |
| 100 | E=0 | EZ |
| 101 | R=1 | R |
| 110 | FGI=1,FGO=1 | FG |
| 111 | DR=0 | DRZ |

|  |  |  |
| --- | --- | --- |
| BR | Function | Symbol |
| 00 | CAR←AD, if condition=1  CAR←CAR+1 , if condition=0 | JMP |
| 01 | CAR←AD, SBR←CAR+1, if condition=1  CAR←CAR+1, if condition=0 | CALL |
| 10 | CAR←SBR | RET |
| 11 | Mapping logic | MAP |

Mapping logic

Mem. ref: CAR(2-4)←IR(12-14), CAR(0,1,5-7) ←0

Reg.ref / IO: CAR(2-5)←Encoded IR(0-11), CAR(0,1) ←0,

CAR(7,6)←01 if Reg.ref, 10 if IO

Microinstruction format 24 bits total

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| F1 | F2 | F3 | CD | BR | AD |
| 4 | 4 | 3 | 3 | 2 | 8 |

Label Microops. CD BR AD

ORG 0

AND NOP I CALL INDRCT

READ U JMP NEXT

AND U JMP FETCH

ORG 4

ADD NOP I CALL INDRCT

READ U JMP NEXT

ADD U JMP FETCH

ORG 8

LDA NOP I CALL INDRCT

READ U JMP NEXT

DRTAC U JMP FETCH

ORG 12

STA NOP I CALL INDRCT

WRITE3 U JMP FETCH

ORG 14 //for ISZ

WRITE DRZ JMP 18

NOP U JMP FETCH

ORG 16 //for ISZ

BUN NOP I CALL INDRCT

ARTPC U JMP FETCH

ORG 18

INCPC U JMP FETCH

ORG 20

BSA NOP I CALL INDRCT

PCTTR U JMP NEXT

WRITE2,INCAR U JMP NEXT

ARTPC U JMP FETCH

ORG 24

ISZ NOP I CALL INDRCT

READ U JMP NEXT

INCDR U JMP 14

ORG 48

FETCH NOP R JMP INTERRPT

RDINS U JMP NEXT

INCPC U MAP

ORG 52

INDRCT INDR U RET

ORG 54

INTERRPT CLRAR,PCTTR U JMP NEXT

WRITE2, CLRPC U JMP NEXT

INCPC, CLRIEN, CLRR U JMP FETCH

ORG 64

HLT CLRS U JMP FETCH

ORG 66

INCPC U JMP FETCH

ORG 68

SZE NOP EZ JMP 66

NOP U JMP FETCH

ORG 72

SZA NOP ACZ JMP 66

NOP U JMP FETCH

ORG 76

SNA NOP ACS JMP 66

NOP U JMP FETCH

ORG 80

SPA NOP ACS JMP FETCH

INCPC U JMP FETCH

ORG 84

INC INCAC U JMP FETCH

ORG 88

CIL CIL U JMP FETCH

ORG 92

CIR CIR U JMP FETCH

ORG 96

CME COME U JMP FETCH

ORG 100

CMA COMAC U JMP FETCH

ORG 104

CLE CLRE U JMP FETCH

ORG 108

CLA CLRAC U JMP FETCH

ORG 152

IOF CLRIEN U JMP FETCH

ORG 156

ION SETIEN U JMP FETCH

ORG 158

INCPC U JMP FETCH

ORG 160

SKO NOP FG JMP 158

NOP U JMP NEXT

ORG 164

SKI NOP FG JMP 158

NOP U JMP NEXT

ORG 168

OUT OUTPT,CLFGO U JMP FETCH

ORG 172

INP INPT, CLFGI U JMP FETCH