DIGITAL-2 MIKROSZKOTECHNIKA U2 07-12-15

D1. a) $35 = 00100011$ $\quad -24 = 11101000$

2P
$$\begin{array}{r} 00100011 \\ 11101000 \\ \hline 00001011 \end{array} \approx 0B_{16}$$

$-128+104=-24$

1P b) $400 \Rightarrow$ 9 BITAR $\quad 2^9 = 512$

1P c) $7 = 0111$

$-7 = 1001$

1P d) 8 BITAR, 1-KOMPL. $\Rightarrow +127$, -128

1P e)

4P f)

X_3X_2 \ X_1X_0	00	01	11	10
00				1
01	1	1	–	–
11			–	
10			1	

$$f = X_1 \cdot X_0 + X_3' \cdot X_2 \cdot X_0 = \left[(X_1 \cdot X_0)' \cdot (X_3' \cdot X_2 \cdot X_0)' \right]'$$

2A $\qquad$ 2A

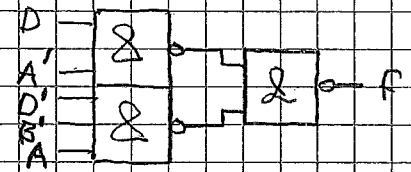
D2.

B \ A	00	01	11	10
00	0	1	0	0
01	0	1	0	0
11	1	0	0	1
10	1	0	0	1

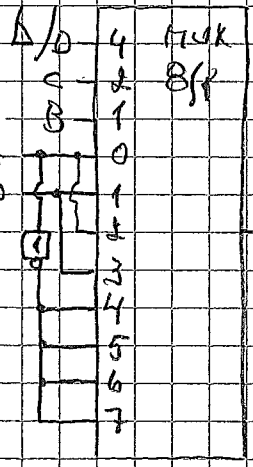
DC a) $f = D \cdot A' + D' \cdot B' \cdot A$

$f = \left[(D \cdot A')' \cdot (D' \cdot B' \cdot A)' \right]'$

ÖGER AVC!

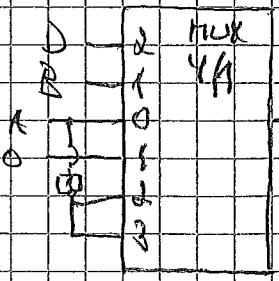


A/D

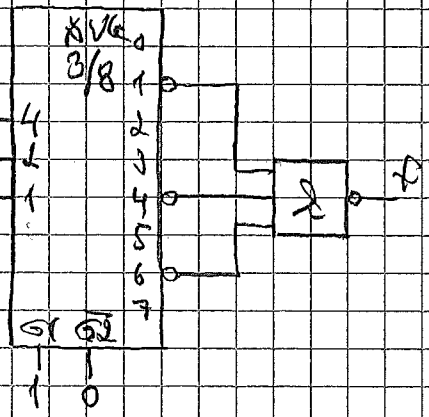


ALT.

D	B	A	f	MUX
0	0	0	0	
0	0	1	1	A
0	1	0	0	
0	1	1	0	0
1	0	0	1	
1	0	1	0	A'
1	1	0	1	
1	1	1	0	A'



c)



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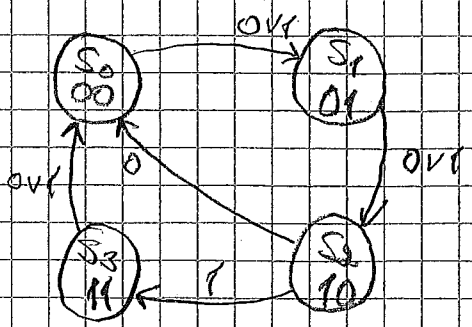
D3.



q_1q_0	X=0	X=1
S_0 00	01	01
S_1 01	10	10
S_3 11	00	00
S_2 10	00	11

$q_1^+ q_0^+$

q_1q_0	J_1	K_1
00	0	-
01	1	-
11	-	1
10	-	1

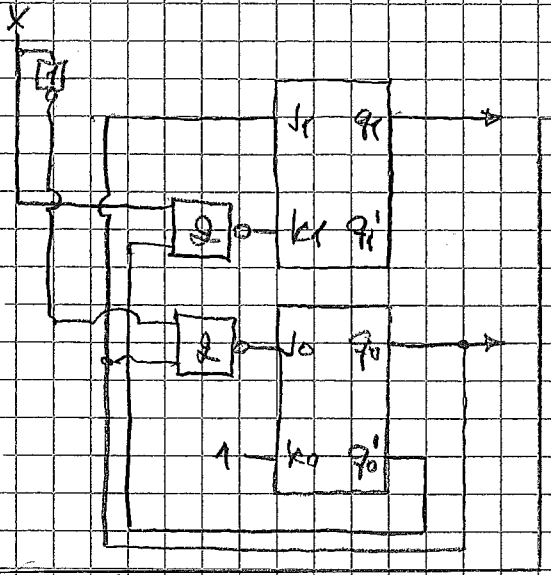
q_1q_0	J_0	K_0
00	1	-
01	-	1
11	-	1
10	0	-

$J_1 = q_0$

$K_1 = X' + q_0' = (X \cdot q_0)'$

$J_0 = q_1' + X = (q_1 \cdot X')'$

$K_0 = 1$



q_1q_0	X=0	X=1
S_0 00	00/0	01/0
S_1 01	00/0	10/0
- 11	--/-	--/-
S_2 10	00/1	01/0

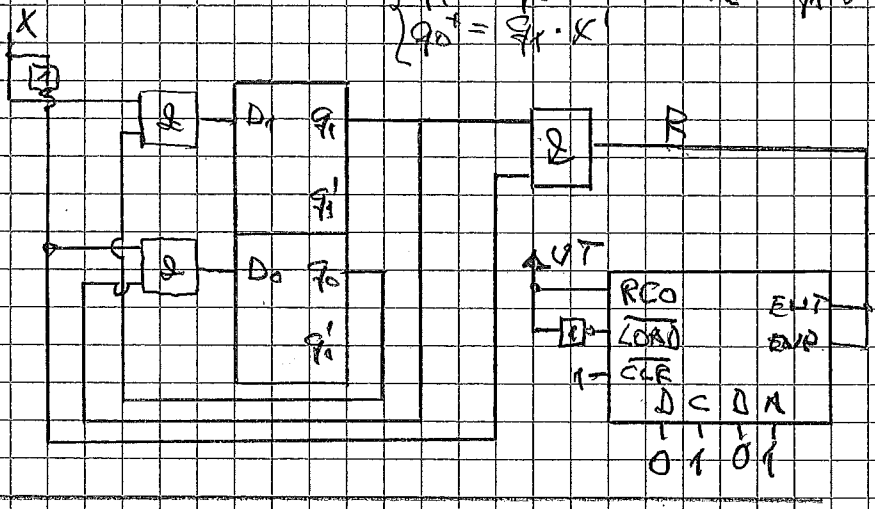
$q_1^+ q_0^+ / R$

q_1q_0	q_1^+	q_0^+	R
00	0	1	0
01	0	0	0
11	-	-	-
10	0	1	1

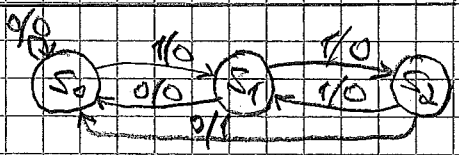
$q_1^+ = q_0 \cdot X$

$q_0^+ = q_1 \cdot X'$

$R = q_1 \cdot X'$



D4.



M5.

	1	2	3	4	5	6	7	8	9	10
	D	F	H	I (A)	G	N	L	A	E	C

M6. ASSEMBLERDIREKTIV – DIRECTIV TILL ASSEMBLATORN (TAR INGEN MASKINKOD) EX. ORG EQU END

INSTRUKTION – ANGER VAD CPU:N SKA UTFÖRA (MASKINKOD/INSTR.) EX. MOVLW ADDWF

M7. SRAM – DRAM a) FÖRDEL SRAM: SNABBARE, INGEN REFRESH

b) NACKDEL SRAM: MINDRE PACKET/KR, FLER TRANSISTORER

M8.

a) 0000–0FFF 4K

b) E000–FFFF 8K

c) 4×8 = 16 KADDSKAR 8K×4

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M9. SUCCESSIV APPROXIMATIONSOMVANDLARE (SAR)
FÖRDEL: SNABB OMVANDLING
NACKDEL: DYR

1. SÄTT $D_3=1$; 1000 JFR V_{out} o Insignal $V_{out}<$ Insign. ⇒ $D_3=1$ annars $D_3=0$

MARS-04

2. SÄTT $D_2=1$ —— " —— $V_{out}<$ Insign ⇒ $D_2=1$ annars $D_2=0$

3. SÄTT $D_1=1$ —— " —— $V_{out}<$ Insign ⇒ $D_1=1$ annars $D_1=0$

4. SÄTT $D_0=1$ —— " —— $V_{out}<$ Insign ⇒ $D_0=1$ annars $D_0=0$

TAR MAX 4 CP

M10.

```
START   MOVLW   0X17   ; (W) <= 0X17     0001 0111
        CALL    ASUB
STOP    GOTO    STOP
ASUB    XORLW   0XFF   ; (W) <- 1110 1000 = 0XE8
        RETURN
```

INNEHÅLLET I ARB.REG W INVERTERAS

M11.

```
        LIST     P=16F874
        INCLUDE  <P16F874.INC>
TEMP    EQU      0X20

        ORG      0x00           ;RESETVEKTOR
;PORTINITIERING
INIT    BSF      STATUS, RP0    ;ÖVERGÅNG TILL BANK1
        MOVLW    0XC8
        MOVWF    TRISB        ;RB7, 6, 3 IN, RB5, 4, 2, 1, 0 UT
        BCF      STATUS,RP0   ;ÅTERGÅNG TILL BANK0

MAIN    MOVF     PORTB,W      ;(W)<--(PORTB)
        ANDLW    0X08         ;MASKA FRAM BIT3
        MOVWF    TEMP         ;(TEMP)<--(W)
        BTFSS    TEMP,3       ;KOLLA BIT3
        B        MAIN         ;BIT3=0 => HOPPA TILL MAIN
        IORLW    0X05         ;BIT3=1 => 1-STÄLL BIT2 o. 0
        MOVWF    PORTB        ;(PORTB)<--(W)
STOP    GOTO     STOP
```

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M18. a)

```
        ORG     0x00            ;RESETVEKTOR
;PORTINITIERING
INIT    BSF     STATUS, RP0     ;ÖVERGÅNG TILL BANK1
        MOVLW   0XFD
        MOVWF   TRISB           ;RB1 UT, övriga IN
        BCF     STATUS,RP0      ;ÅTERGÅNG TILL BANK0

MAIN    MOVF    PORTB,W         ;(W)<--(PORTB)
        BTFSC   PORTB,7         ;KOLLA RB7
        GOTO    ON              ;RB0=1
OFF     ANDLW   0XFD            ;RB7=0, 0-STÄLL RB1
        MOVWF   PORTB           ;(PORTB)<--(W)
        GOTO    SLUT            ;
ON      IORLW   0X02            ;1-STÄLL RB1
        MOVWF   PORTB           ;(PORTB)<--(W)
SLUT    GOTO    MAIN
```

b)

```
TEMP    EQU     0X20

        ORG     0x00            ;RESETVEKTOR
        GOTO    INIT

        ORG     0X04
        GOTO    HANDLER

        ORG     0X10
;PORTINITIERING
INIT    BSF     STATUS, RP0     ;ÖVERGÅNG TILL BANK1
        MOVLW   0XFD
        MOVWF   TRISB           ;RB1 UT, övriga IN
        BCF     STATUS,RP0      ;ÅTERGÅNG TILL BANK0
;AVBROTTSINITIERING
        BSF     INTCON,7        ;GIE=1
        BSF     INTCON,3        ;RBIE=1

MAIN    GOTO    MAIN

HANDLER MOVF    PORTB,W         ;(W)<--(PORTB)
        BTFSC   PORTB,7         ;KOLLA RB7
        GOTO    ON              ;RB0=1
OFF     ANDLW   0XFD            ;RB7=0, 0-STÄLL RB1
        MOVWF   PORTB           ;(PORTB)<--(W)
        GOTO    SLUT            ;
ON      IORLW   0X02            ;1-STÄLL RB1
        MOVWF   PORTB           ;(PORTB)<--(W)
SLUT    BCF     INTCON,0        ;RBIF=0
        RETFIE
```

M13.

```
MAX     EQU     0X20
ANTAL   EQU     0X21            ;(ANTAL) VÄLJES HÄR TILL 10
TEMP    EQU     0X22
        ORG     0x00            ;RESETVEKTOR
MAIN        MOVLW   0X0A
        MOVWF   ANTAL
        CLRF    MAX
LOOP    DECF    ANTAL,W         ;FIXA TILL OFFSETVÄRDET
        CALL    TABELL          ;ANROPA TABELL
        MOVWF   TEMP            ;SPARA TABELLVÄRDET I TEMP
        SUBWF   MAX,W           ;(MAX-(W)-->(W)
        BTFSC   STATUS,C        ;KOLLA C, >=0 C=1, <0 C=0
        GOTO    HOPP            ;
        MOVF    TEMP,W          ;(TEMP)-->(W)
        MOVWF   MAX             ;(W)-->(MAX)
HOPP    DECFSZ  ANTAL,1
        GOTO    LOOP
SLUT    GOTO    SLUT            ;

TABELL  ADDWF   PCL,1       ;Positionsnummer
        RETLW       0X12        ;0
        RETLW       0X32        ;1
        RETLW       0X33        ;2
        RETLW       0X22        ;3
        RETLW       0X10        ;4
        RETLW       0X63        ;5
        RETLW       0X42        ;6
        RETLW       0X65        ;7
        RETLW       0X34        ;8
        RETLW       0X11        ;9
```