

Mata Kuliah

Dasar Teknik Digital

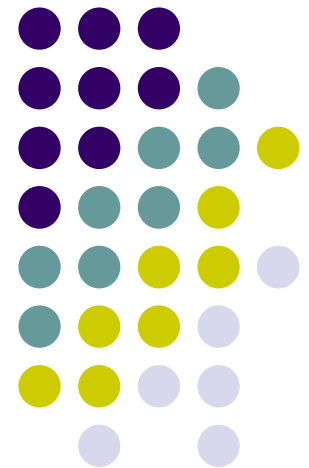
TKE 113



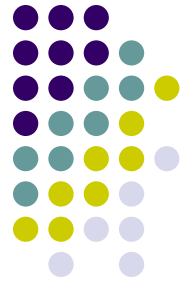
7. PENCACAH

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Universitas Sumatera Utara USU
2006



Pencacah Reguler



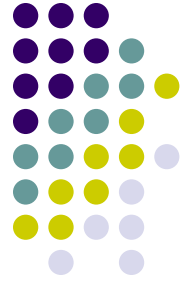
Tabel 7.1. Tabel keadaan pencacah biner berurutan.

A	B	C	D	A+	B+	C+	D+	A	B	C	D	A+	B+	C+	D+
0	0	0	0	0	0	0	1	0	0	0	0	1	1	1	1
0	0	0	1	0	0	1	0	0	0	0	1	0	0	0	0
0	0	1	0	0	0	1	1	0	0	1	0	0	0	0	1
0	0	1	1	0	1	0	0	0	0	1	1	0	0	1	0
0	1	0	0	0	1	0	1	0	1	0	0	0	0	1	1
0	1	0	1	0	1	1	0	0	1	0	1	0	1	0	0
0	1	1	0	0	1	1	1	0	1	1	0	0	1	0	1
0	1	1	1	1	0	0	0	0	1	1	1	0	1	1	0
1	0	0	0	1	0	0	1	1	0	0	0	0	1	1	1
1	0	0	1	1	0	1	0	1	0	0	1	1	0	0	0
1	0	1	0	1	0	1	1	1	0	1	0	1	0	0	1
1	0	1	1	1	1	0	0	1	0	1	1	1	0	1	0
1	1	0	0	1	1	0	1	1	1	0	0	1	0	1	1
1	1	0	1	1	1	1	0	1	1	0	1	1	1	0	0
1	1	1	0	1	1	1	1	1	1	1	0	1	1	0	1
1	1	1	1	0	0	0	0	1	1	1	1	1	1	1	0

(a) Pencacah naik

(b) Pencacah turun

Pencacah dengan flip-flop T



Pencacah Naik.

A	B	C	A+B+C'	T _A	T _B	T _C
0	0	0	0 0 1	0	0	1
0	0	1	0 1 0	0	1	1
0	1	0	0 1 1	0	0	1
0	1	1	1 0 0	1	1	1
1	0	0	1 0 1	0	0	1
1	0	1	1 1 0	0	1	1
1	1	0	1 1 1	0	0	1
1	1	1	0 0 0	1	1	1

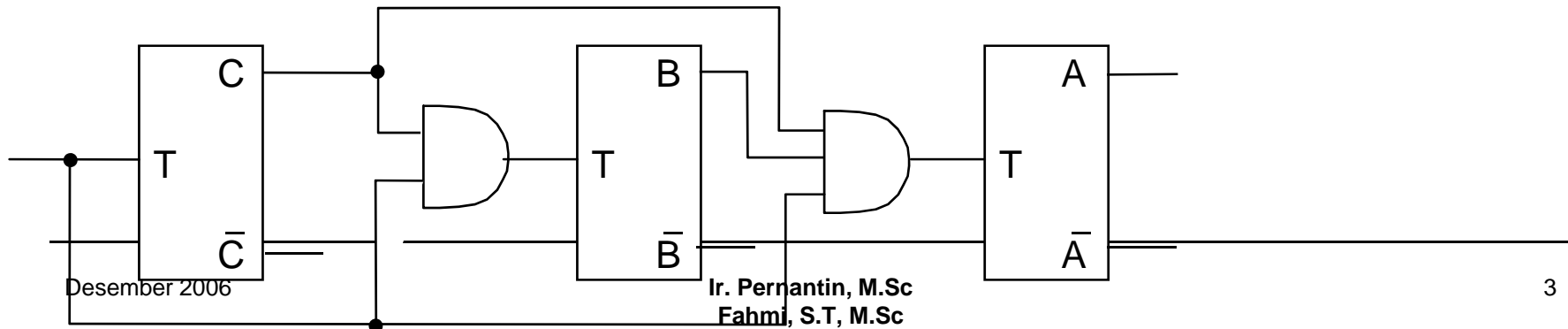
AB

C	00	01	11	10
0				
1		1	1	
$T_A = BC$				

AB

C	00	01	11	10
0				
1	1	1	1	1
$T_B = C$				

$T_C = 1$



Pencacah dengan flip-flop T



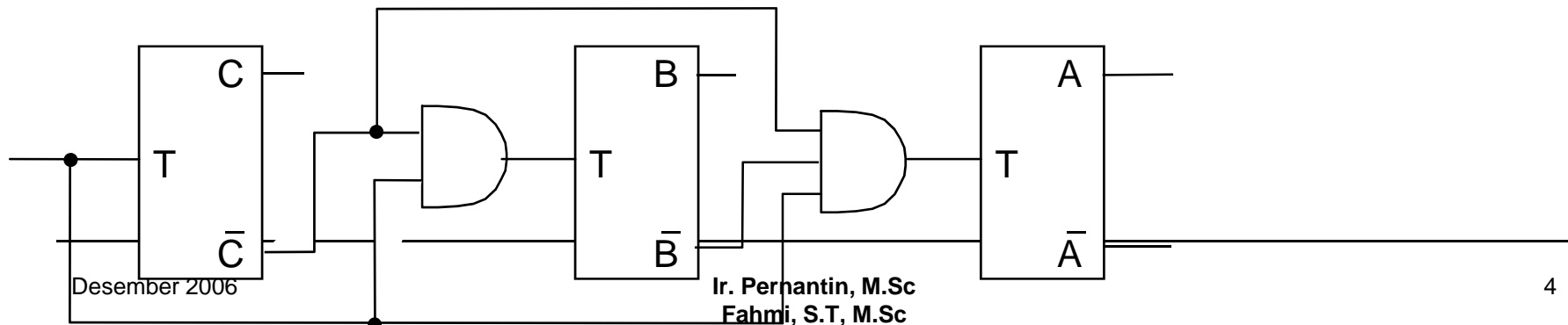
Pencacah Turun.

A	B	C	A+B+C+	T _A	T _B	T _C
0	0	0	1	1	1	1
0	0	1	0	0	0	1
0	1	0	0	0	1	1
0	1	1	0	0	0	1
1	0	0	0	1	1	1
1	0	1	1	0	0	1
1	1	0	1	0	1	1
1	1	1	1	0	0	1

C \ AB	00	01	11	10
0	1			1
1				
$T_B = \bar{B}\bar{C}$				

C \ AB	00	01	11	10
0	1	1	1	1
1				
$T_B = \bar{C}$				

T_C = 1



Desember 2006

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Dasar Teknik Digital TKE 113

Pencacah dengan flip-flop T

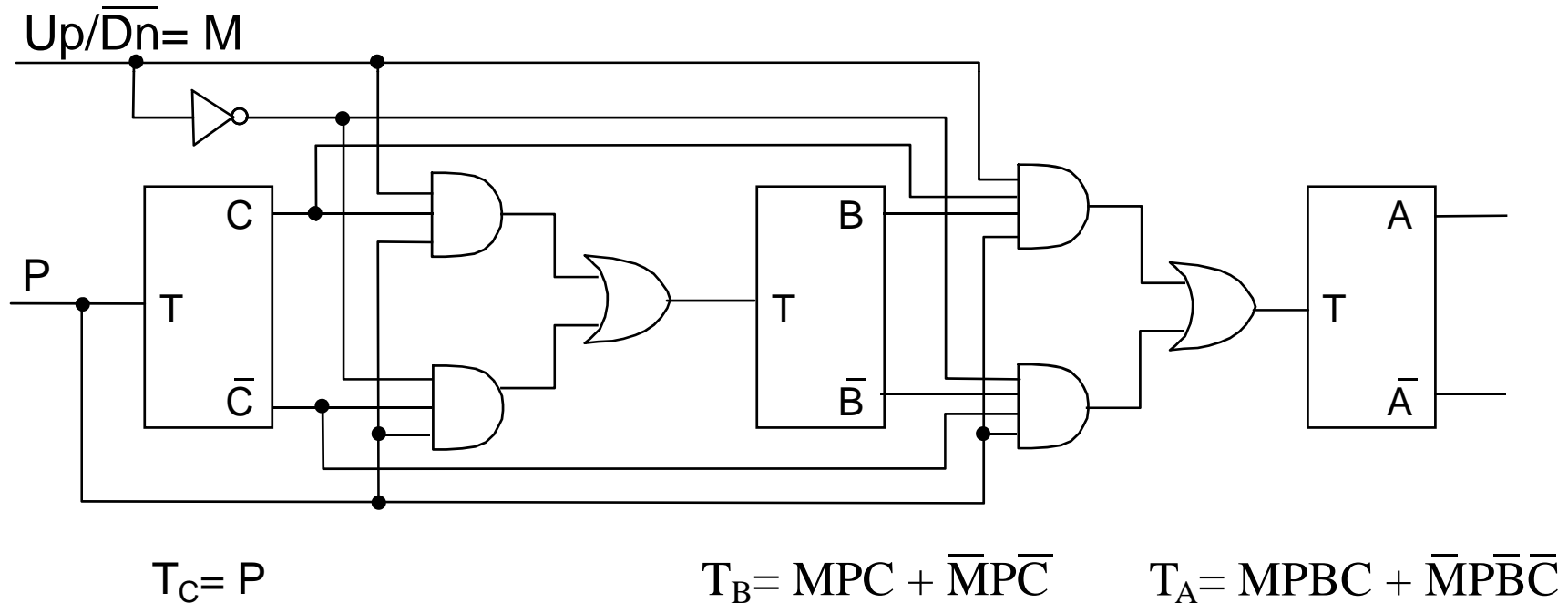


Pencacah Naik-Turun

Up/ $\overline{\text{Dn}}$ = M

M = 0 Down

M = 1 Up



Pencacah tak beraturan



A B C	A+B+C+
0 0 0	0 1 1
0 0 1	- - -
0 1 0	1 0 0
0 1 1	0 1 0
1 0 0	1 0 1
1 0 1	0 0 0
1 1 0	- - -
1 1 1	- - -

		BC	
		0	1
A	00	1	
	01	x	
	11	x	
	10	1	x

A^+

		BC	
		0	1
A	00	1	
	01	x	
	11	1	x
	10		x

B^+

		BC	
		0	1
A	00	1	1
	01	x	
	11	x	
	10		x

C^+

		AB			
		00	01	11	10
C	0		1	x	
	1	x		x	1

$T_A = \overline{B}C + B\overline{C}$
= $B \oplus C$

		AB			
		00	01	11	10
C	0	1	1	x	
	1	x		x	

$T_B = \overline{A}C$

		AB			
		00	01	11	10
C	0	1		x	1
	1	x	1	x	1

$T_C = \overline{B} + C$

Pencacah tak beraturan: flip-flop T, Diagram Rangkaian

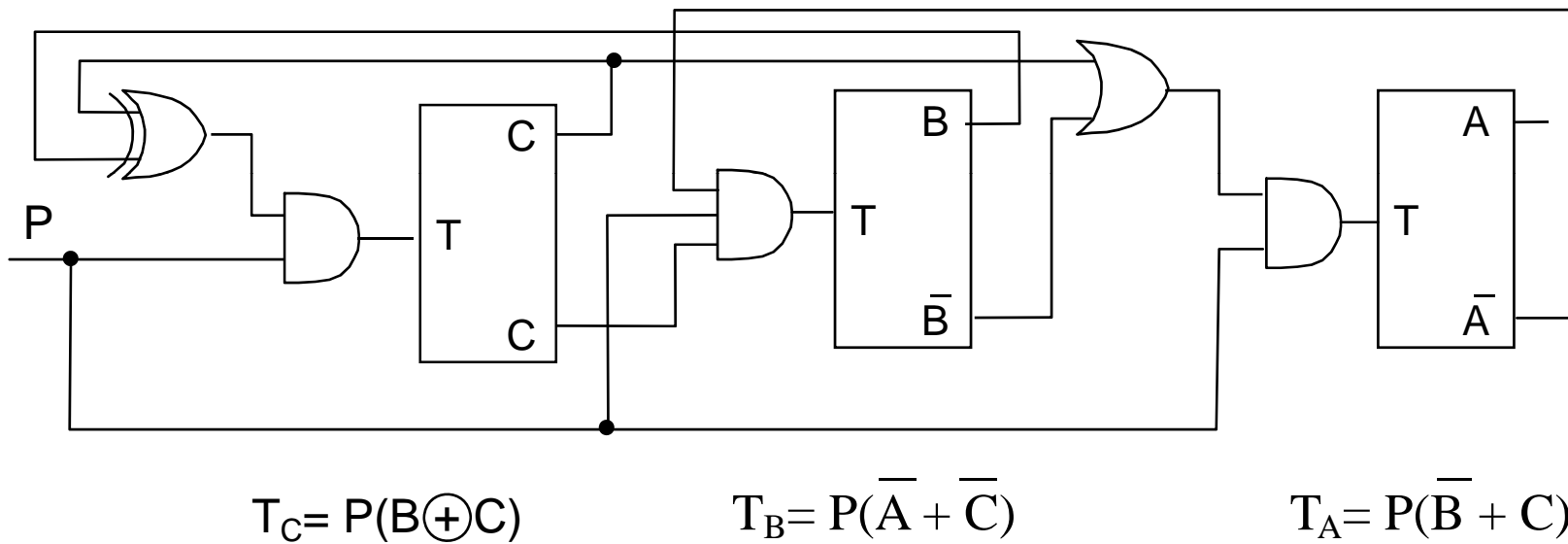
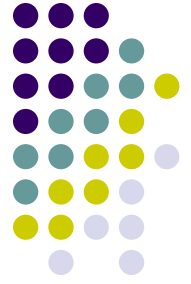
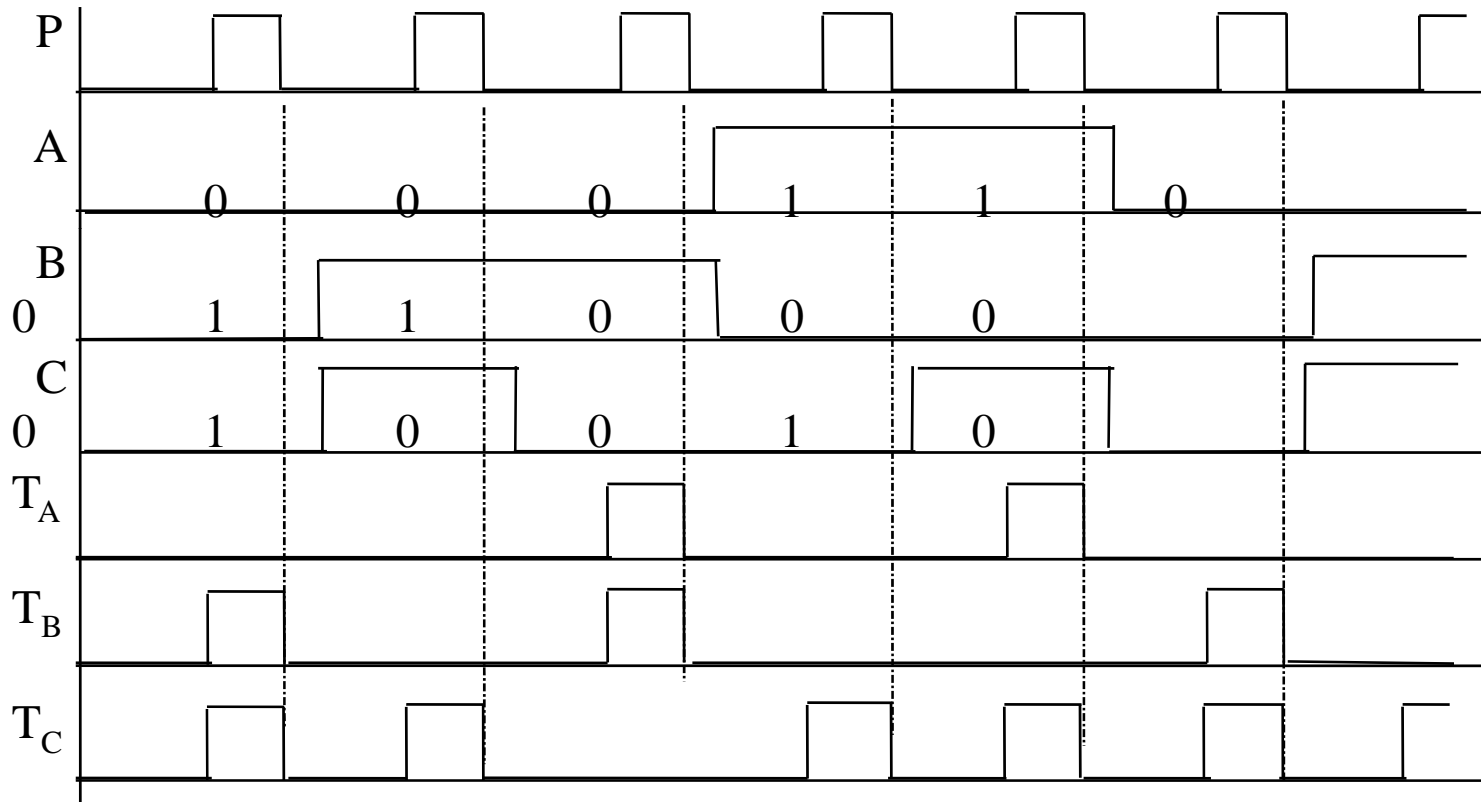
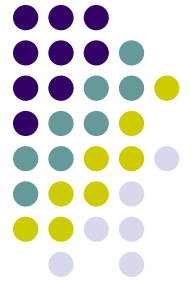


Diagram waktu pencacah **irreguler**



Pencacah dengan flip-flop RS



A B C	A+B+C+	R _A S _A	R _B S _B	R _C S _C
0 0 0	0 1 1	x 0	0 1	0 1
0 0 1	- - -	x x	x x	x x
0 1 0	1 0 0	0 1	1 0	0 x
0 1 1	0 1 0	x 0	0 x	1 0
1 0 0	1 0 1	0 x	0 x	0 1
1 0 1	0 0 0	1 0	x 0	1 0
1 1 0	- - -	x x	x x	x x
1 1 1	- - -	x x	x x	x x

Q	Q ⁺	R	S
0	0	x	0
0	1	0	1
1	0	1	0
1	1	0	x

Peta-K Pencacah dengan RS



A				
BC	0	1	0	1
00		x	x	
01	x		x	1
11		x	x	x
10	1	x		x

$S_A = BC^-$ $R_A = C$

A				
BC	0	1	0	1
00	1			x
01	x		x	x
11	x	x		x
10		x	1	x

$S_B = \bar{A}\bar{B}$ $R_B = B\bar{C}$

A				
BC	0	1	0	1
00	1	1		
01	x		x	1
11		x	1	x
10		x	x	x

$S_C = \bar{B}\bar{C}$ $R_C = C$

(c)

AB				
C	00	01	11	10
0	0	1	x	1
1	x	0	x	0

A^+

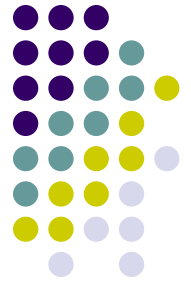
AB				
C	00	01	11	10
0	1	0	x	0
1	x	1	x	0

B^+

AB				
C	00	01	11	10
0	1	0	x	1
1	x	0	x	0

C^+

Pencacah dengan flip-flop JK



Peta Keadaan Berikut

A B C	A+B+C ⁺	J _A K _A	J _B K _B	J _C K _C
0 0 0	0 1 1	0 x	1 x	1 x
0 0 1	- - -	x x	x x	x x
0 1 0	1 0 0	1 x	x 1	0 x
0 1 1	0 1 0	0 x	x 0	x 1
1 0 0	1 0 1	x 0	0 x	1 x
1 0 1	0 0 0	x 1	0 x	x 1
1 1 0	- - -	x x	x x	x x
1 1 1	- - -	x x	x x	x x

Q	Q ⁺	J	K
0	0	0	x
0	1	1	x
1	0	x	1
1	1	x	0

Peta-K Pencacah dengan JK



A				
BC	0	1	0	1
00		x	x	
01	x	x	x	1
11		x	x	x
10	1	x	x	x

 $J_A = BC^-$ $K_A = C$

A				
BC	0	1	0	1
00	1		x	x
01	x		x	x
11	x	x		x
10	x	x	1	x

 $J_B = \bar{A}$ $K_B = \bar{C}$

A				
BC	0	1	0	1
00	1	1	x	x
01	x	x	x	1
11	x	x	1	x
10		x	x	x

 $J_C = \bar{B}$ $K_C = 1$

AB				
C	00	01	11	10
0	0	1	x	1
1	x	0	x	0

 A^+

AB				
C	00	01	11	10
0	1	0	x	0
1	x	1	x	0

 B^+

AB				
C	00	01	11	10
0	1	0	x	1
1	x	0	x	0

 C^+

Peta-K Pencacah dengan ff D



		AB			
		00	01	11	10
C	0	0	1	x	1
	1	x	0	x	0

A^+

$$D_A = A\bar{C} + B\bar{C}$$

		AB			
		00	01	11	10
C	0	1	0	x	0
	1	x	1	x	0

B^+

$$D_B = \bar{A}\bar{B} + AC$$

		AB			
		00	01	11	10
C	0	1	0	x	1
	1	x	0	x	0

C^+

$$D_C = \bar{B}\bar{C}$$

Pencacah dalam Rangkaian Terpadu

