

The background of the slide is a soft-focus photograph of pink flowers and tall, thin grasses. A dark red rectangular box with rounded corners is centered in the upper half of the slide, containing the author's name and ID.

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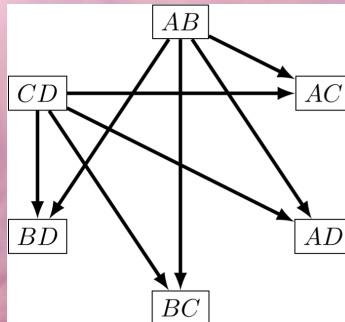
Introduction to Automata Theory, Formal Languages and Computation

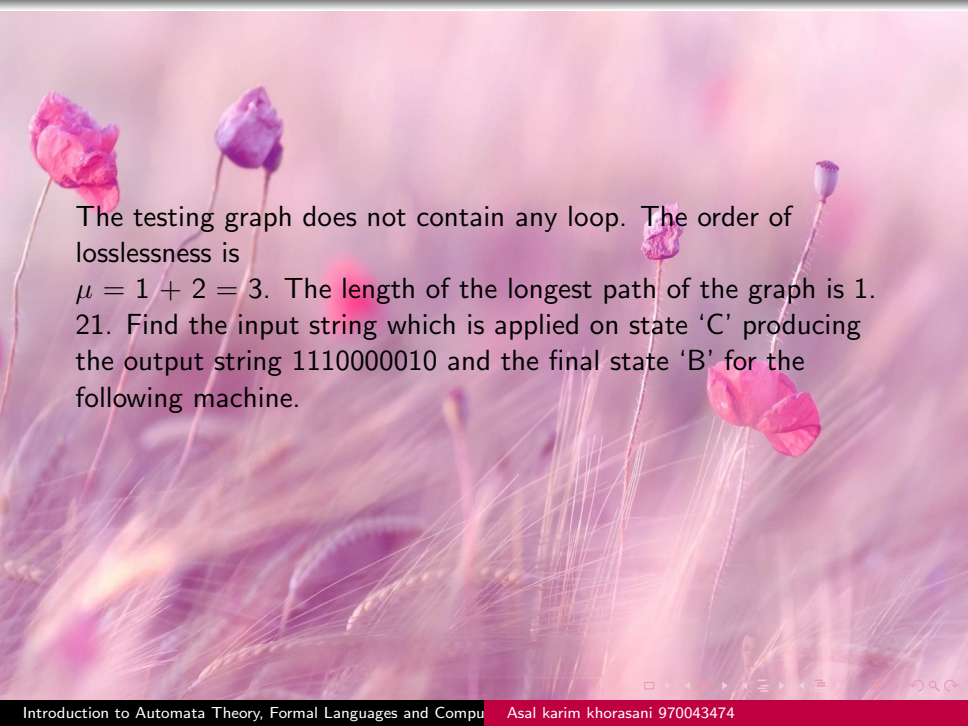
Present State	Next State	
	Z = 0	Z = 1
A	(AB)	
B	(CD)	
C		(CD)
D		(AB)
(AB)	(AC)(AD) (BC)(BD)	
(CD)		(AC)(AD) (BC)(BD)
(AC)		
(AD)		
(BC)		
(BD)		

The testing table does not contain any repeated entry. The machine is an information lossless machine.

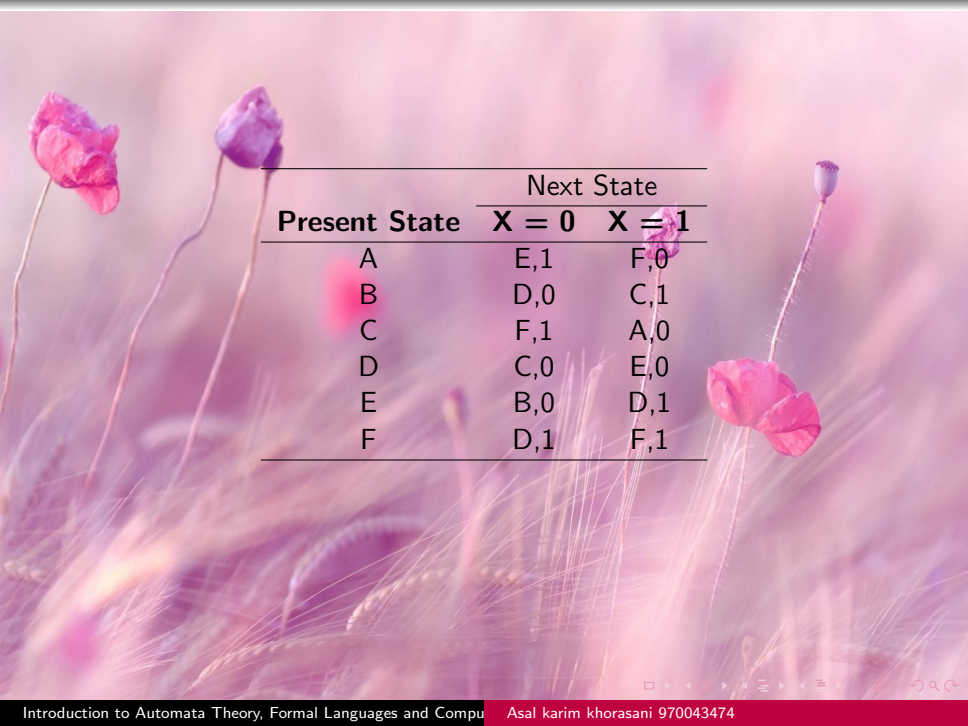
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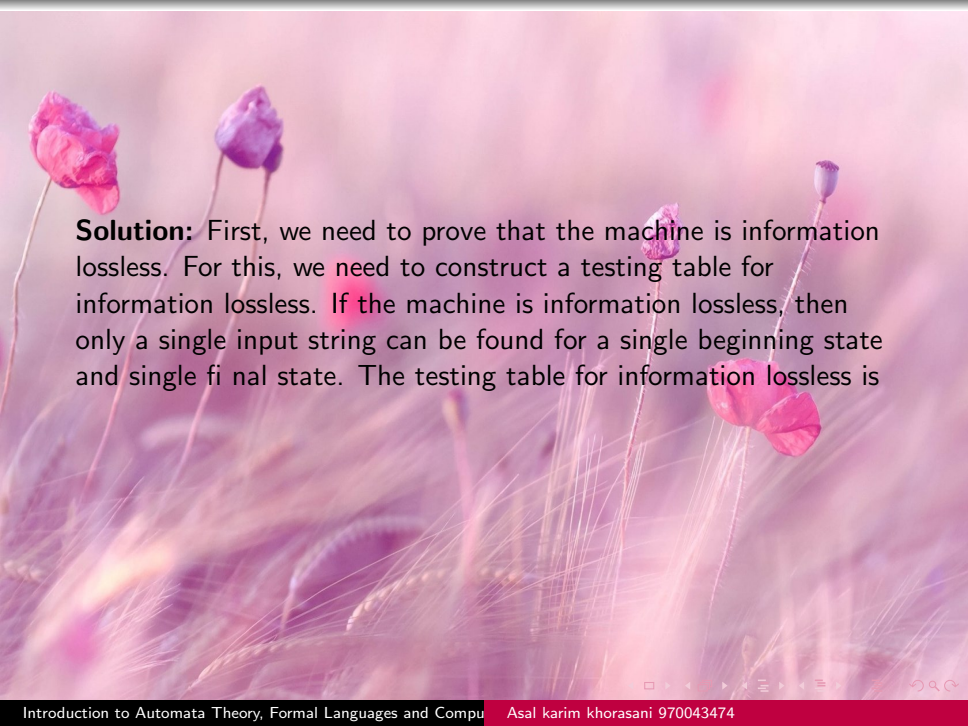


A soft-focus background image of pink poppies in a field, with some flowers in bloom and others as buds on thin stems.

The testing graph does not contain any loop. The order of losslessness is $\mu = 1 + 2 = 3$. The length of the longest path of the graph is 1. 21. Find the input string which is applied on state 'C' producing the output string 1110000010 and the final state 'B' for the following machine.



Present State	Next State	
	X = 0	X = 1
A	E,1	F,0
B	D,0	C,1
C	F,1	A,0
D	C,0	E,0
E	B,0	D,1
F	D,1	F,1

A soft-focus background image of a field with pink flowers and tall grass. The flowers are in various stages of bloom, with some showing vibrant pink petals and others as buds. The grass is a mix of green and yellow, suggesting a late summer or autumn setting. The overall lighting is warm and diffused, creating a gentle, dreamy atmosphere.

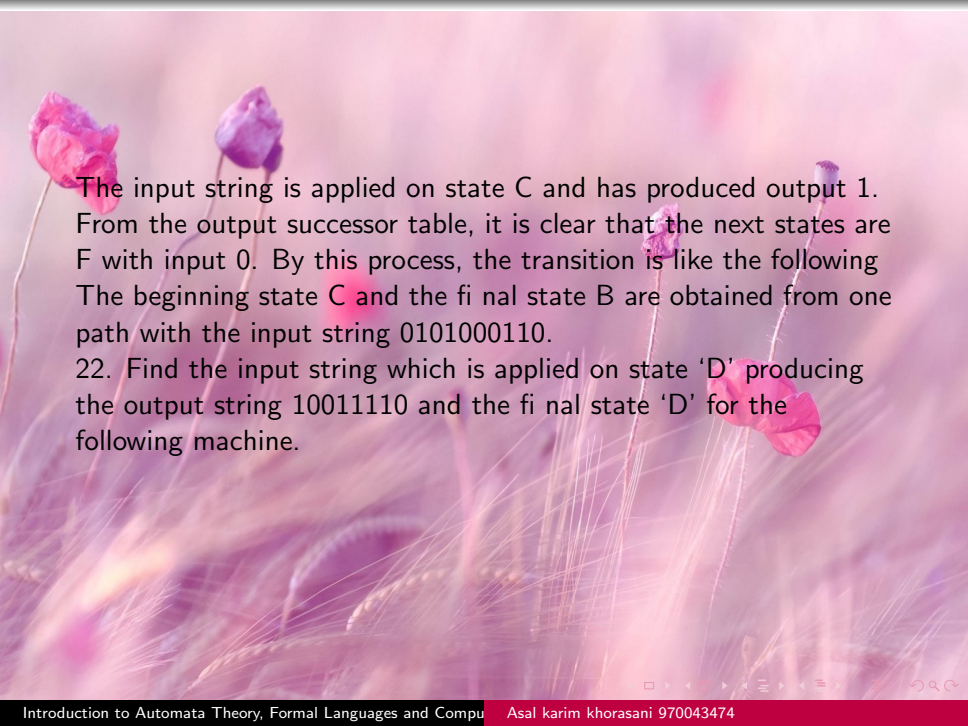
Solution: First, we need to prove that the machine is information lossless. For this, we need to construct a testing table for information lossless. If the machine is information lossless, then only a single input string can be found for a single beginning state and single final state. The testing table for information lossless is

Present State	Next State	
	Z = 0	Z = 1
A	F	E
B	D	C
C	A	F
D	(CE)	
E	B	D
F		(DF)
CE	AB	DF
AB	DF	CE
DF		

The testing table does not contain any repeated entry. The machine is an information lossless machine.

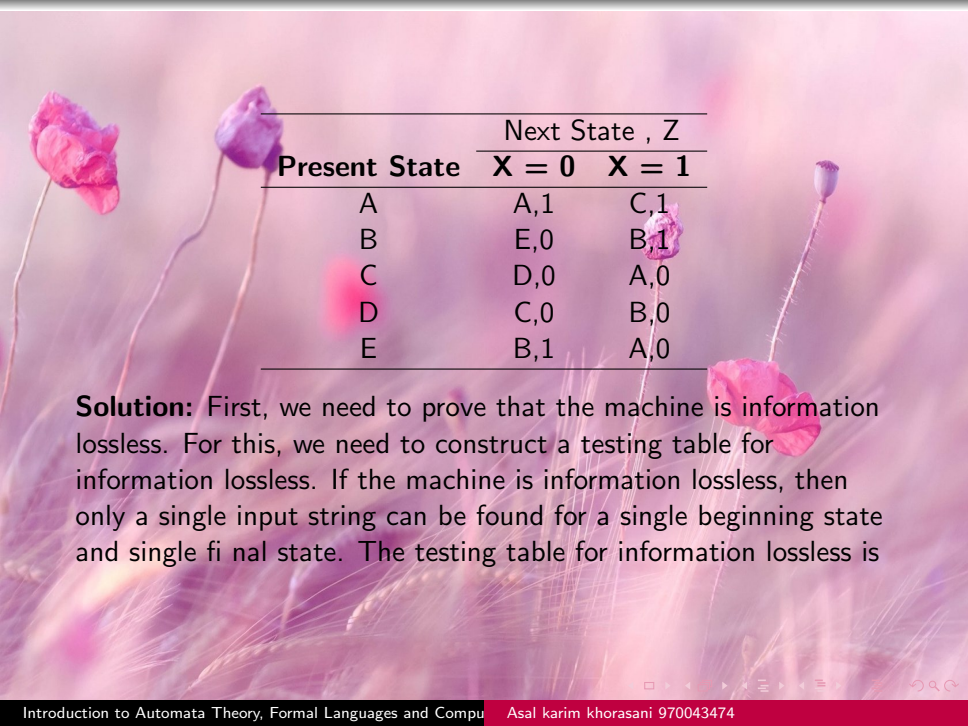
The output successor table for the given machine is

Present State	Next State , I/P	
	Z = 0	Z = 1
A	F,1	E,0
B	D,0	C,1
C	A,1	F,0
D	(C,0) (E,1)	
E	B,0	D,1
F		(D,0) (F,1)

The background of the slide features a soft-focus image of pink flowers and tall, thin grasses, creating a gentle, natural aesthetic.

The input string is applied on state C and has produced output 1. From the output successor table, it is clear that the next states are F with input 0. By this process, the transition is like the following The beginning state C and the final state B are obtained from one path with the input string 0101000110.

22. Find the input string which is applied on state 'D' producing the output string 10011110 and the final state 'D' for the following machine.



Present State	Next State , Z	
	X = 0	X = 1
A	A,1	C,1
B	E,0	B,1
C	D,0	A,0
D	C,0	B,0
E	B,1	A,0

Solution: First, we need to prove that the machine is information lossless. For this, we need to construct a testing table for information lossless. If the machine is information lossless, then only a single input string can be found for a single beginning state and single final state. The testing table for information lossless is

Present State	Next State	
	Z = 0	Z = 1
A		(AC)
B	E	B
C	(AD)	
D	(BC)	
E	A	B
AC		
AD		
BC	(AE)(DE)	
AE		(AB)(BC)
DE	(AB)(AC)	
AB		(AB)(BC)

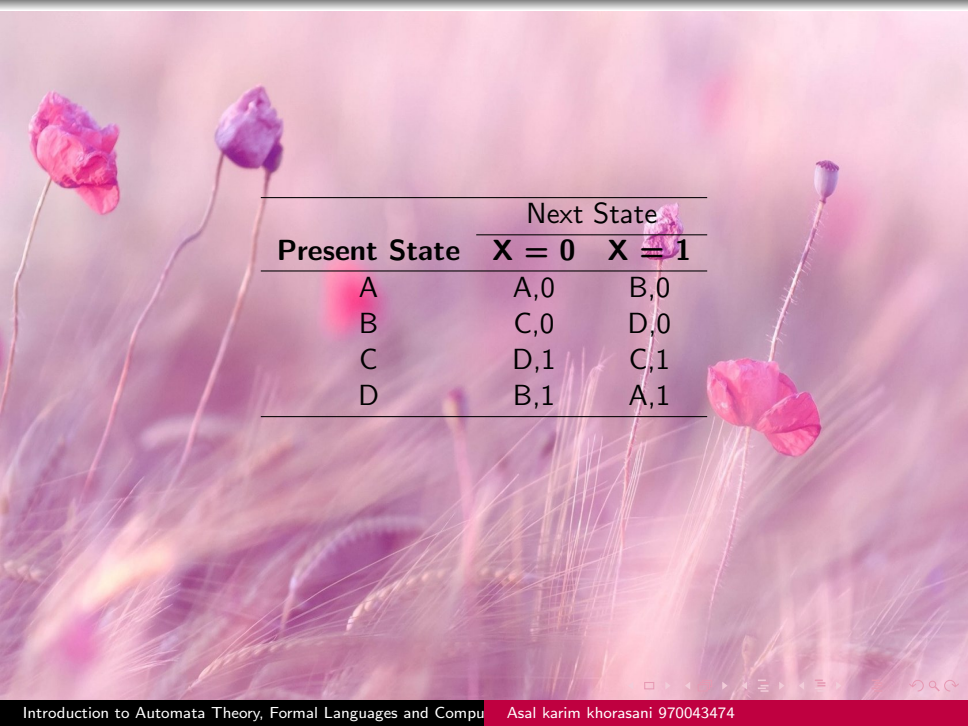
The testing table does not contain any repeated entry. The machine is an information lossless machine. The output successor table for the given machine is

Present State	Next State , I/P	
	Z = 0	Z = 1
A		(A,0),(C,1)
B	E,0	B,1
C	(D,0),(A,1)	
D	(C,0),(B,1)	
E	A,1	B,0

The transition is like the following

The beginning state B and the final state D are obtained from one path with the input string 10100010.

23. Retrieve the input sequence from the machine when it was initially in state B, has, in response to yet unknown input sequence, produced the output sequence 01110, and terminated in state B.



Present State	Next State	
	$X = 0$	$X = 1$
A	A,0	B,0
B	C,0	D,0
C	D,1	C,1
D	B,1	A,1