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Theory of Computing

Automata Full Course Tutorial (JavaPoint): https://www.javatpoint.com/automata-tutorial

Book Solution (not all just selected few): http://infolab.stanford.edu/~ullman/ialcsols/sols.html

Lecture notes form IIT Kanpur: https://github.com/timkartar/CS340_TOC

Video tutorial form Neso Academy:
https://www.youtube.com/playlist?list=PLBlnK6fEyqRgp46KUv4ZY69yXmpwKOIev
And a mix playlist also saved to my youtube library

Video tutorial from CSEGURU:
https://www.youtube.com/playlist?list=PLYT7YDstBQmHSRKrNApTqquo2FRlMsoHw

Video tutorial from Anita R:
https://www.youtube.com/playlist?list=PL6xbXi2C3sePDwyboAcu7l1UYuUT2SWYd

Chapters:
1. Finite Automata
2. Regular Expressions and Languages
3. Properties of Regular Languages
4. Context-Free Grammar and Languages
5. Pushdown Automata
6. Properties of Context-Free Languages
7. Introduction to Turing Machines

NFA to DFA: see slide(Lazy Creation method)

e-NFA to DFA:
main way(slide er moto): ▶ Theory of Computation: Conversion of Epsilon-NFA to DFA
Another way: ▶ E-Closure : E-NFA to DFA Conversion

e-NFA to NFA: https://www.youtube.com/watch?v=Vobgo5t5SQA

DFA to RE: [New easiest way found!   >> State elimination]

(follow 3rd point)
 Two ways: 1. See the theorem from book
2. State elimination (Anita R onk details dewa, you can just use basic sutro)
3. See this video of state elimination also. **This is much better(explained with formula)**: https://youtu.be/5m8tQjWdQFk

Note: (last 2ta state thakar khetre)
(note1: in this video last a 'r' state eliminate korar por p-r-p er jei equation ber house oita p er self loop hisebe thakbe, then next step a just p state thakbe je nije starting state and finishing state so, RE hobe p er equation er upor *)
(note2: eikhane p amar start sate chilo and accepting state o chilo tai amra boi er oi (R+SU*T)*SU* use korte pari nai. Ei equation tokhni use hobe jokhn start state final state thakbe na)

Regular expression simplify: https://youtu.be/JzeimJjSY4Q   video 36 & 37

RE to e-NFA: see from Anita R lecture
 ▶️ Theory of Computation: Conversion of RE to Epsilon-NFA   (note: in this lecture while some operation of concatenation she hasn't used the e transition, you can think it is wrong but it is correct and used widely by all. So, you can use like this, or you can add e transition like slide)

Pumping lemma:
1. The general method is the correct method written in the book or other websites or books(where we don't assume pumping length a value instead assume general p, then solve it)
2. Prove through assumption where we assume a value for pumping lemma p, then solve this.
   i. Now for this way, The method of Anita R is good enough as she checks first |xy|<=p and this must be done. So, her way of solving this is correct.
   ▶️ Theory of Computation: Pumping Lemma for Regular Languages

ii. The ways of Neso academy is not good enough as it doesn't checks $|xy|<=p$ first. And there are a lot of comments in that video lecture from different professors which shows that it is wrong in that way. We should use p as general.

▶ Pumping Lemma (For Regular Languages) | Example 1

Minimization of DFA (Table filling algo) : (note: ignore slide rule to fill table)
   See neso: https://youtu.be/UiXkJUTkp44
   Also see CSE guru(same like neso): https://youtu.be/o34C4l5OhN4
   //Furthermore you can see minimization through equivalence from nesco playlist

Equivalence of Two DFA:
 Just 2ta dfa k akta dfa consider kobo…then table filling algo calaia dibo… jodi first er dfa er start state second dfa er start state soman pai table fill kora por…tahole dfa 2ta equal

Ambiguity and removal: ▶ Ambiguity in Grammar and its removal Trick..

PDA practice problem:
1. Ei page a valo valo problem dewa ace:
   https://www.geeksforgeeks.org/construct-pushdown-automata-given-languages/
2. Eikhaneo valo kichu example ace
   https://scanftree.com/automata/dpda-for-number-of-a-equal-to-number-of-b-in-string

CFG to PDA: https://youtu.be/ztpehUPnsL4
PDA to CFG: https://youtu.be/ntMdkSpR6os

Pumping lemma for CFL: see from Anita R https://youtu.be/KyQc054-BEU
                            Best if can solve as text book.