Solved by
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Question No: 27 (Marks: 2)

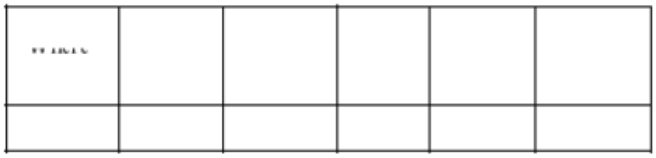
Diffrentiate between Regular and Non regular languages?

Ans:The main difference between regular and non regular language are as:

1. The regular language is that language which can be expressed by RE is known as regular language whereas any language which can not be expressed by RE is known as non regular language.

Question No: 32 (Marks: 3)

What does the the following tape of turing machine show?



Ans:
Arbitrary Summary Table:

The arbitrary summary table shows the trip from READ9 to READ3 does not pop one letter form the STACK it adds two letters to the STACK.
Row11 can be concatenated with some other net style sentences e.g. row11 net(READ3, READ7, a)Net(READ7, READ1, b)Net(READ1, READ8, b) it gives the non terminal Net(READ9, READ8, b),
The whole process can be written as:

Net(READ9, READ8, b) ?Row11Net(READ3, READ7,a) Net(READ7, READ1, b)Net(READ1, READ8, b)

Question No: 29 (Marks: 2)

What are the halt states of PDAs?

Ans:

There are some halts states in PDA which are as:

Accept or reject stat is also halt state.

Reject state is like dead non final state.

Accept state is like final state.

Question No: 36 (Marks: 5)

What are the conditions (any five) that must be met to know that PDA is in conversion form?

Ans:

Conversion form of PDA:

A PDA is in conversion form if it has following conditions:

1. The PDA must begin with the sequence

2. There is only one ACCEPT state.

3. Every edge leading out of any READ or HERE state goes directly into a POP state.

4. There are no REJECT states.

5. All branching, deterministic or nondeterministic occurs at READ or HERE states.

6. The STACK is never popped beneath this $ symbol.

7. No two POPs exist in a row on the same path without a READ or HERE.

8. Right before entering ACCEPT this symbol is popped out and left.

Question No: 18 (Marks: 1)

Can you say that for a certain string there may be more than one paths in a TG?
Ans : TG there is only one certain path state but in GTG there is lot of states and paths

Question No: 19 (Marks: 2)

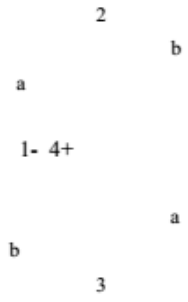
If a language can be accepted by an FA then it can be accepted by a TG as well.
What are the other two statements of kleenes's theorem?
Ans : TG and FA are same but TG is also considered as FA and FA is also Considered as a TG as well

Question No: 20 (Marks: 3)

Describe the method of NFA corresponding to Concatenation of FAs.
Ans : NFA build with FA there is TWO FA concatenate with each other and some useless state can be eliminate then NFA

Question No: 21 (Marks: 5)

Draw FA corresponding to following NFA?



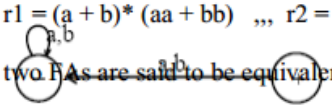
What does an automaton mean? (2 marks)

What does automata mean?
It is the plural of automaton, and it means "something that works automatically"

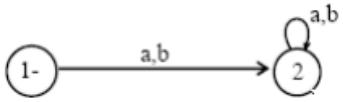
Finite automata with output? (3 marks)

Finite automata with output? (3 marks)
Answer:- (Page 55)
FA which generates an output string corresponding to each input String Such machines are called machines with output. There are two types of machines with output. Moore machine and Mealy machine.

Explain Equivalent? (3 marks)
Answer:- (Page 55)
Two regular expressions are said to be equivalent if they generate the same language.
r1 = (a + b)* (aa + bb) ,,, r2 = (a + b)*aa + (a + b)*bb ,,, r1 = r2



two FAs are said to be equivalent, if they accept the same language



Explain Nondeterminism? (2 marks)

Nondeterminism
TGs and GTGs provide certain relaxations *i.e.* there may exist more than one path for a certain string or there may not be any path for a certain string, this property creates **nondeterminism** and it can also help in differentiating TGs or GTGs from FAs. Hence an FA is also called a Deterministic Finite Automaton (DFA).

Different between word and strings? 2 marks
Answer: - (Page 3)
Words are strings belonging to some language while Concatenation of finite number of letters from the alphabet is called a string.

What is Transition? 2 marks
Answer:- (Page 11)
For each state and for each input letter showing how to move from one state to another.

Nondeterministic finite automaton (NFA) (5 marks)

Nondeterministic Finite Automaton (NFA)
Definition
An NFA is a TG with a unique start state and a property of having single letter as label of transitions. An NFA is a collection of three things
Finite many states with one initial and some final states
Finite set of input letters, say, Σ = {a, b, c}
Finite set of transitions, showing where to move if a letter is input at certain state (∧ is not a valid transition), there may be more than one transition for certain letters and there may not be any transition for certain letters.

Explain Equivalent? (3 marks)

Equivalent Regular Expressions

Definition

Two regular expressions are said to be equivalent if they generate the same language.

Example

Consider the following regular expressions

$r_1 = (a + b)^* (aa + bb)$

$r_2 = (a + b)^*aa + (a + b)^*bb$ then both regular expressions define the language of strings ending in aa or bb.

Proof (Kleene's Theorem) (5 marks)

Proof

Since L is a regular language, so by Kleene's theorem, there exists an FA, say F, accepting the language L. Converting each of the final states of F to non-final states and old non-final states of F to final states, FA thus obtained will reject every string belonging to L and will accept every string, defined over Σ, not belonging to L. Which shows that the new FA accepts the language L^c. Hence using Kleene's theorem L^c can be expressed by some RE. Thus L^c is regular.

Different between Distinguishable strings and indistinguishable strings? 3 marks

Distinguishable strings and Indistinguishable strings

Two strings x and y, belonging to Σ^*, are said to be **distinguishable** w.r.t a language $L \subseteq \Sigma^*$ if there exists a string z belonging to Σ^* s.t. $xz \in L$ but $yz \notin L$ or $xz \notin L$ but $yz \in L$.

Two strings x and y, belonging to Σ^*, are said to be **indistinguishable** with respect to a language $L \subseteq \Sigma^*$ if for every string z belonging to Σ^*, either both xz or $yz \in L$ or both don't belong to L.

Explain Mealy machine ? 3 marks

Mealy machine

A Mealy machine consists of the following

A finite set of states $q_0, q_1, q_2, \ldots$ where q_0 is the initial state.

An alphabet of letters $\Sigma = \{a,b,c,\ldots\}$ from which the input strings are formed.

An alphabet $\Gamma = \{x,y,z,\ldots\}$ of output characters from which output strings are generated.

A pictorial representation with states and directed edges labeled by an input letter along with an output character. The directed edges also show how to go from one state to another corresponding to every possible input letter.

(It is not possible to give transition table in this case.)

NFA corresponding to the Closure of an FA 5 marks

NFA corresponding to the Closure of an FA

Apparently, it seems that since closure of an FA accepts the Null string, so the required NFA may be obtained considering the initial state of given FA to be final as well, but this may allow the unwanted string to be accepted as well. For example, an FA, with two states, accepting the language of strings, defined over. $\Sigma = \{a, b\}$, **ending in a**, will accept all unwanted strings, if the initial state is supposed to be final as well.

TGs: accepting all strings, accepting none, starting with b, not ending in b, containing aa, containing aa or bb…….. 5 marks

Question No: 33 (Marks: 3)

Find Pref (Q in R) for:

Q = {10, 11, 00, 010}

R = {01001, 10010, 0110, 10101, 01100, 001010}

Example
Let Q = {aa,abaaabb,bbaaaaa,bbbbbbbbbb} and R = {b,bbbb,bbbaaa,bbbaaaaa}
It can be observed that aa and bbaaaaa occur at the ending parts of some words of R, hence these words help in defining the language pref(Q in R). Thus pref(Q in R) = {b,bbba,bbbaaa}

Aik string given thi usko tokenize krna tha.....2

This string can be tokenized in two different ways
(Ba), (bab), (B)
(B), (abab), (B)

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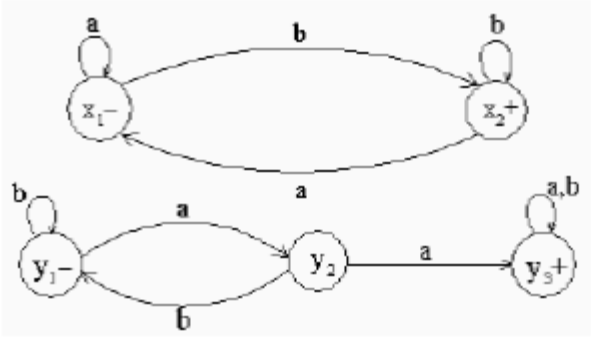
Question No: 26 (Marks: 5) - Please choose one



Show the transition table of FA_1+FA_2

Answer

Old States	New States after reading	
	a	b
$z_1-\equiv(x_1,y_1)$	$(x_1,y_2)\equiv z_2$	$(x_2,y_1)\equiv z_3$
$z_2\equiv(x_1,y_2)$	$(x_1,y_3)\equiv z_4$	$(x_2,y_1)\equiv z_3$
$z_3+\equiv(x_2,y_1)$	$(x_1,y_2)\equiv z_2$	$(x_2,y_1)\equiv z_3$
$z_4+\equiv(x_1,y_3)$	$(x_1,y_3)\equiv z_4$	$(x_2,y_3)\equiv z_5$
$z_5+\equiv(x_2,y_3)$	$(x_1,y_3)\equiv z_4$	$(x_2,y_3)\equiv z_5$

Q No 3.Moore and Mealy machine?

1. In order to run a string on a Mealy or Moore machine, you can take directions from transition table. Running string on Mealy or Moore machine is similar to running string on a FA. For example, if want to run abba on the machine, take start from initial state. Check what is the transition for a, what state it goes. After that check what is the path of b from that state and so on. In this way you will be able to run whole of the string. Note that there is no final state in Mealy or Moore machine. So there is no case of acceptance or rejection of string. You just have to determine what the output is. I hope that will clear your mind for further clarification please listens to your

lecture carefully.
2. The string is taken for the testing purposes. You can take any sort of string and determine its output using machine.

1) What is the function of mealy machine?
Answer:- (Page 60)
1's complementing and incrementing machines which are basically Mealy machines are very much helpful in computing.

Q No 1.How Moore and Mealy machine works in Computer Memory what is their importance in Computing ?

Mealy & Moore Machines work in computing as incrementing machine & 1's complement machine etc. These operations as basic computer operations so these machines are very important.