Muhammad Moaaz Siddiq – MCS(4th)
Moaaz.pk@gmail.com
Campus:- Institute of E-Learning & Moderen Studies
(IEMS) Samundari

What is the concept of the Union of FA's ?
Answer:- (Page 32)
FA3 be an FA corresponding to r1+ r2, and then the initial state of FA3 must correspond to the initial state of FA1 and the initial state of FA2.

What does mean the LANGUAGE IS CLOSED?
Answer:- (Page 90)
Closed w.r.t. concatenation i.e.the language expressed by RE of type r*.

Stack consistence means that in the PDA?
Answer:- (Page 123)
when a row pops a character it should be there at the top of the STACK

-Where Null string is use the most?
Answer:-
The choice of null string depends on the requirements of the language. In some case we need to have null string to be accepted by the FA.

PUSHDOWN AUTOMATON (PDA)?
Answer:- (Page 119)
PUSHDOWN STACK or PUSHDOWN STORE
PUSHDOWN STACK is a place where the input letters can be placed until these letters are referred again. It can store as many letters as one can in a long column.
Initially the STACK is supposed to be empty i.e. each of its storage location contains a blank.

دنیا میں سب سے مشکل کام اپنی اصلاح اور سب سے آسان کام دوسروں پر نکتہ چینی کرنا ہے

Muhammad Moaaz Siddiq – MCS(4th)
Moaaz.pk@gmail.com
Campus:- Institute of E-Learning & Moderen Studies
(IEMS) Samundari

Muhammad Moaaz Siddiq – MCS(4th)
Moaaz.pk@gmail.com
Campus:- Institute of E-Learning & Moderen Studies
(IEMS) Samundari

Prefixes of a language in another language?

Answer:- (Page 78)

Prefixes of a language in another language

If two languages R and Q are given, then the language the prefixes of Q in R denoted by Pref(Q in R) is the set of strings of letters that, when concatenated to the front of some word in Q to produce some word in R i.e.

Pref(Q in R) = the set of all strings p such that there exists words q in Q and w in R such that pq = w. Following are the examples in this regard

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}

Conversion form of PDA?

Answer:- (Page 119)

Conversion form of PDA

A PDA is in conversion form if it fulfills the following conditions:

There is only one ACCEPT state.

There are no REJECT states.

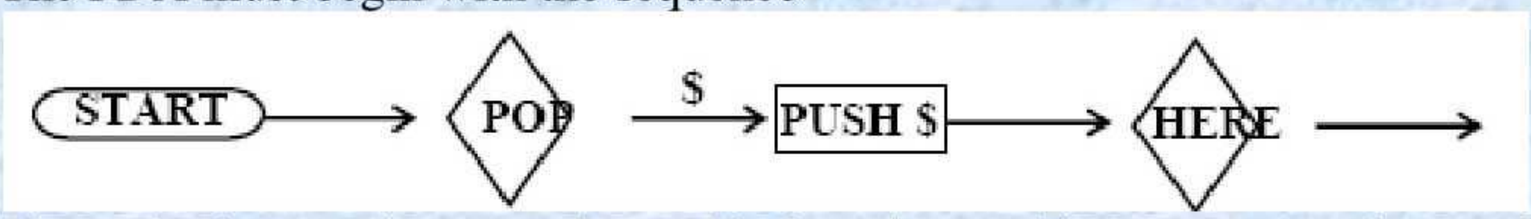
Every READ or HERE is followed immediately by a POP i.e. every edge leading out of any READ or HERE state goes directly into a POP state.

No two POPs exist in a row on the same path without a READ or HERE between them whether or not there are any intervening PUSH states (i.e. the POP states must be separated by READs or HEREs).

All branching, deterministic or nondeterministic occurs at READ or HERE states, none at POP states and every edge has only one label.

Even before we get to START, a "bottom of STACK" symbol $ is placed on the STACK. If this symbol is ever popped in the processing it must be replaced immediately. The STACK is never popped beneath this symbol. Right before entering ACCEPT this symbol is popped out and left.

The PDA must begin with the sequence



The entire input string must be read before the machine can accept the word.

Is automata is a programming subject or theoretical ??? marks 3

Answer:-

In theoretical computer science, automata theory is the study of mathematical objects called abstract machines or automata and the computational problems that can be solved using them. Automata mean "self-acting".

Automata theory is also closely related to formal language theory. An automaton is a finite representation of a formal language that may be an infinite set. Automata are often classified by the class of formal languages they are able to recognize.

بری صحبت سے تنہائی بہتر ہے اور تنہائی سے نیک صحبت بہتر ہے

Muhammad Moaaz Siddiq – MCS(4th)
Moaaz.pk@gmail.com
Campus:- Institute of E-Learning & Moderen Studies
(IEMS) Samundari

Muhammad Moaaz Siddiq – MCS(4th)
Moaaz.pk@gmail.com
Campus:- Institute of E-Learning & Moderen Studies
(IEMS) Samundari

Parsing Techniques (5 number)

Answer:- (Page 136)

Recall the CFG for arithmetic expression

S→S+S|S*S|number

It was observed that the word 3+4*5 created ambiguity by considering its value either 23 or 35. To remove this ambiguity, the CFG was modified to S→(S+S)|(S*S)|number

There arises a question that whether a new CFG can be defined without having parentheses with operator hierarchy (i.e. * before +)? The answer is yes. Following is the required PLUS'TIMES grammar S→E, E→T+E|T, T→F*T|F, F→(E)|i

Where i stands for any identifier i.e. number or of storage location name (variable). Following is the derivation of i+i*i

S ⇒E

⇒T+E

⇒F+E

⇒i+E

⇒i+T

⇒i+F*T

⇒i+i*T

⇒i+i*F

⇒i+i*i

-What are live and dead productions. (5 number)

Answer:- (Page 127)

Live production: A production of the form nonterminal → string of two nonterminals is called a live production.

Dead production: A production of the form nonterminal → terminal is called a dead production.

Muhammad Moaaz Siddiq – MCS(4th)
Moaaz.pk@gmail.com
Campus:- Institute of E-Learning & Moderen Studies
(IEMS) Samundari

Muhammad Moaaz Siddiq – MCS(4th)
Moaaz.pk@gmail.com
Campus:- Institute of E-Learning & Moderen Studies
(IEMS) Samundari

1: How can we define languages elaborate any five ways.

Answer:- (Page 4)

Defining Languages

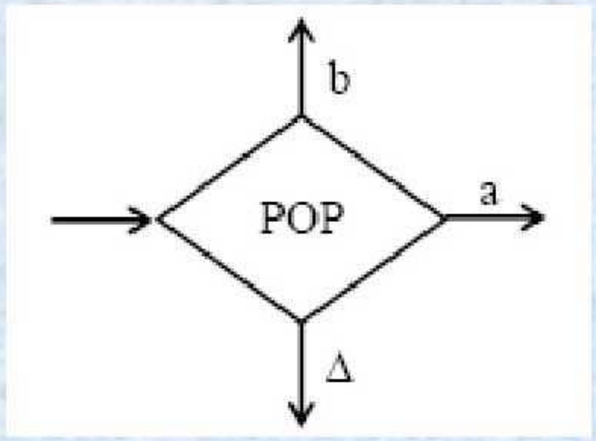
The languages can be defined in different ways , such as Descriptive definition, Recursive definition, using Regular Expressions (RE) and using Finite Automaton (FA) etc.

2: Describe the POP operation and draw symbol for POP state in context of Push down stack.

Answer:- (Page 107)

POP :

POP is an operation that takes out a letter from the top of the STACK. The rest of the letters are moved one location up. POP state is expressed as



3: Write two difference and two similarities between DFA and NFA.

Answer:- Click here for detail

Difference

1-In FA Finite number of states, having one initial and some (maybe none) final states. While in NFA Finite many states with one initial and some final state. 2-In FA for each state and for each input letter there is a transition showing how to move from one state to another while in NFA there may be more than one transition for certain letters and there may not be any transition for certain letters. 3-In FA □ is valid while in NFA □ is not valid.

Common

Every Language that can be recognized by a DFA can also be recognized by a NFA. The reverse is True.
Both DFA and NFA can only have one start state. But they can have multiple Final states.
Finite set of input letters

اللہ کا خوف سب سے بڑی دانائی ہے

Muhammad Moaaz Siddiq – MCS(4th)
Moaaz.pk@gmail.com
Campus:- Institute of E-Learning & Moderen Studies
(IEMS) Samundari

Muhammad Moaaz Siddiq – MCS(4th)
Moaaz.pk@gmail.com
Campus:- Institute of E-Learning & Moderen Studies
(IEMS) Samundari

Concept of unit production in CFG? [3 marks]

Answer:- (Page 100)

The productions of the form nonterminal → one nonterminal, is called the unit production.
Unit production is removed in CFG

While converting mealy to Moore num of states remain same or not? justify [5]

Answer:- (Page 61)

Theorem

Statement

For every Mealy machine there is a Moore machine that is equivalent to it (ignoring the extra character printed the Moore machine).

Proof

Let M be a Mealy machine. At each state there are two possibilities for incoming transitions
The incoming transitions have the same output character.
The incoming transitions have different output characters.
If all the transitions have same output characters, then shift that character to the corresponding state.

If all the transitions have different output characters, then the state will be converted to as many states as the number of different output characters for these transitions, which shows that if this happens at state q then q will be converted to qi^1 and qi2 i.e. if at qi there are the transitions with two output characters then qi1 for one character and q2 for other character.

Shift the output characters of the transitions to the corresponding new states qi and qi. Moreover, these new states q1 and q2 should behave like q as well. Continuing the process, the machine thus obtained, will be a Moore machine equivalent to Mealy machine M.

Muhammad Moaaz Siddiq – MCS(4th)
Moaaz.pk@gmail.com
Campus:- Institute of E-Learning & Moderen Studies
(IEMS) Samundari

Muhammad Moaaz Siddiq – MCS(4th)
Moaaz.pk@gmail.com
Campus:- Institute of E-Learning & Moderen Studies
(IEMS) Samundari

Consider the language L which is EVEN-EVEN, defined over Σ = {a,b}. In how many classes does L may partition Σ*. Explain briefly.(MArks 3)

Answer:- (Page 77)

Consider the language L which is EVEN'EVEN, defined over Σ = {a,b}. It can be observed that L partitions Σ* into the following four classes

C1= set of all strings with even number of a's and odd number of b's.

C2= set of all strings with odd number of a's and odd number of b's.

C3= set of all strings with odd number of a's and even number of b's.

C4= set of all strings with even number of a's and even number of b's.

Q.3: What does mean the LANGUAGE IS CLOSED?(MArks 3)

Answer:- Rep

Q7: If two FA have no final state how the intersection of those FA will have final state? (marks 2)

Answer:- (Page 83)

If Both the FAs have no final state, so these FAs accept nothing. This implies that their union will not also accept any string. Hence FA corresponding to the language (L1∩ L2c) ∪ (L1c∩ L2) accepts nothing. Thus both the languages are equivalent.

Q:8 give RE for EVEN - EVEN language. (Marks 2)

Answer:- (Page 16)

Consider the EVEN) EVEN language, defined over Σ = {a, b}. As discussed earlier that EVEN)EVEN language can be expressed by the regular expression (aa+bb+(ab+ba)(aa+bb)*(ab+ba))* b

use of push and pop states

Answer:- (Page 107)

A PUSH operator adds a new letter at the top of STACK,

POP is an operation that takes out a letter from the top of the STACK. The rest of the letters are moved one location up.

ایماندار کو غصہ دیر سے آتا ہے اور جلدی دور ہو جاتا ہے

Muhammad Moaaz Siddiq – MCS(4th)
Moaaz.pk@gmail.com
Campus:- Institute of E-Learning & Moderen Studies
(IEMS) Samundari

Muhammad Moaaz Siddiq – MCS(4th)
Moaaz.pk@gmail.com
Campus:- Institute of E-Learning & Moderen Studies
(IEMS) Samundari

Write point of kleen's theorem? 2marks

Answer:- (Page 25)

Kleene's Theorem

If a language can be expressed by

FA or

TG or

RE

Then it can also be expressed by other two as well.

It may be noted that the theorem is proved, proving the following three parts

Kleene's Theorem Part I

If a language can be accepted by an FA then it can be accepted by a TG as well.

Kleene's Theorem Part II

If a language can be accepted by a TG then it can be expressed by an RE as well.

Kleene's Theorem Part III

If a language can be expressed by a RE then it can be accepted by an FA as well.

زندگی میں کامیابی کا یہی راز ہے کہ پریشانیوں سے پریشان مت بنو

Muhammad Moaaz Siddiq – MCS(4th)
Moaaz.pk@gmail.com
Campus:- Institute of E-Learning & Moderen Studies
(IEMS) Samundari

Muhammad Moaaz Siddiq – MCS(4th)
Moaaz.pk@gmail.com
Campus:- Institute of E-Learning & Moderen Studies
(IEMS) Samundari

What is meant by decidable problem? 2marks

Answer:- (Page 80)

Decidable problem

A problem that has decision procedure is called decidable problem e.g. the following problems

The two regular expressions define the same language.

The two FAs are equivalent.

Define strings. With example. 3marks

Answer:- (Page 3)

Concatenation of finite number of letters from the alphabet is called a string.

Write regular expression contain even words defined over sigma={a, b} 3marks

Answer:- (Page 9)

((a+b)(a+b))*

Find Pref (Q in R) for:

Q = {10, 11, 00, 010}

R = {01001, 10010, 0110, 10101, 01100, 001010} 3 marks

Answer:-

Pref (Q in R) ={10,01,011,001}

Explain Semi word and word with example?

Answer:- (Page 97)

Semiword

A semiword is a string of terminals (may be none) concatenated with exactly one nonterminal on the right i.e. a semiword, in general, is of the following form

(terminal)(terminal)⋯ (terminal)(nonterminal)

S→aaaaS

word

A word is a string of terminals. Λ is also a word.

S→aaaa

a) Write RE defined over Σ ={a, b} strings not ending on aa, ab. 5marks

Answer:-

(a+b)*(ba+bb)

b) Write RE defined over Σ = {a, b} strings must end on aa,ab

Answer:-

(a+b)*(aa+ab)

جھوٹ انسان اور ایمان دونوں کا دشمن ہے

Muhammad Moaaz Siddiq – MCS(4th)
Moaaz.pk@gmail.com
Campus:- Institute of E-Learning & Moderen Studies
(IEMS) Samundari

Muhammad Moaaz Siddiq – MCS(4th)
Moaaz.pk@gmail.com
Campus:- Institute of E-Learning & Moderen Studies
(IEMS) Samundari

What does mean the LANGUAGE IS CLOSED? 3marks
Answer:- Rep

Explain CFG and even-even language. 5marks
Answer:- (Page 87-90)
CFG
CFG is a collection of the followings
An alphabet Σ of letters called terminals from which the strings are formed, that will be the words of the language.
A set of symbols called non-terminals, one of which is S, stands for "start here".
A finite set of productions of the form
Non-terminal → finite string of terminals and /or non-terminals.
Following grammar generates EVEN-EVEN language.
Σ = {a,b}
productions:
S → SS
S → XS
S → Λ
S → YSY
X → aa
X → bb
Y → ab
Y → ba

OR

Consider the following CFG
S → aaS|bbS|abX|baX|Λ
X → aaX|bbX|abS|baS,
The corresponding language is EVEN-EVEN.

Differentiate b/w FA, TG and GTG?
Answer:-
FA
A Finite automaton (FA), is a collection of the followings
Finite number of states, having one initial and some (maybe none) final states.
Finite set of input letters (Σ) from which input strings are formed.
Finite set of transitions i.e. for each state and for each input letter there is a transition showing how to move from one state to another.

عقل مند کہتا ہے میں کچھ نہیں جانتا جبکہ بے وقوف کہتا ہے کہ میں سب کچھ جانتا ہوں

Muhammad Moaaz Siddiq – MCS(4th)
Moaaz.pk@gmail.com
Campus:- Institute of E-Learning & Moderen Studies
(IEMS) Samundari

Muhammad Moaaz Siddiq – MCS(4th)
Moaaz.pk@gmail.com
Campus:- Institute of E-Learning & Moderen Studies
(IEMS) Samundari

TG

A Transition graph (TG), is a collection of the followings

Finite number of states, at least one of which is start state and some (maybe none) final states.

Finite set of input letters (Σ) from which input strings are formed.

Finite set of transitions that show how to go from one state to another based on reading specified substrings of input letters, possibly even the null string (Λ).

GTG

A generalized transition graph (GTG) is a collection of three things

Finite number of states, at least one of which is start state and some (maybe none) final states.

Finite set of input letters (Σ) from which input strings are formed.

Directed edges connecting some pair of states labeled with regular expression.

It may be noted that in GTG, the labels of transition edges are corresponding regular expressions

Muhammad Moaaz Siddiq – MCS(4th)
Moaaz.pk@gmail.com
Campus:- Institute of E-Learning & Moderen Studies
(IEMS) Samundari