CORPORATE INSTITUTE OF SCIENCE & TECHNOLOGY, BHOPAL

Theory of Computation (CS-501)

Assignments - 1

Q1. For the given relation set, Find

R = {(a,b), (a,c), (c,d), (a,a), (b,a)}

i) Transitive closure.

Reflexive and Transitive closure.

Q2. Construct CFG for the following set:

$L = \{a^{2n}b^{m}c^{2m}d^{n} \mid n>= 0\}$

Q3. Construct PDA for the following set:

$L = \{a^{n}b^{m}c^{k}d^{n} \mid n,m,k>= 0\}$

Q4. Define Turing Machine and its component.

Q5. Define P & NP problem.

Assignments – 2

Q1. Define NFA and DFA with example.

Q2. Is PDA is more powerful than FSM? Justify your answer.

Q3. Define Parse tree.

Q4. Design a TM to find 2's complement of given binary number.

Q5. Compare Turing machine model with FSM model.

Assignments – 3

Q1. Use pumping lemma to prove that the following sets are not regular.

$L = \{a^{n} \mid n \text{ is prime number}\}$

Q2. Consider the following grammar

S → aB | bA

A → a | aS | bAA

B → b | bS | aBB

with 'S' as the starting symbol. Find the leftmost and rightmost derivations for the string "bbaaba"

Q3. Construct PDA for the following set:

$L = \{a^{2n}b^{n} \mid n>= 1\}$

Q4. Define Turing machine as enumerator.

Q5. Design turing machine to accept language $L = \{a^{n}b^{n}c^{n} \mid n>=1\}$.

Assignments – 4

Q1. Make a FDA which accepts all the integer numbers divisible by 3.

Q2. Design FSM which accept all the string that does not contain a substring "aab" for input symbol {0, 1}

Q3. Show that the given grammar is ambiguous

S → aB | bA

A → a | aS | bAA

B → b | bS | aBB

Q4. Construct PDA for the following set:

$L = \{a^n b^m c^m d^n \mid n >= 0\}$

Q5. Construct the PDA that accepts ($WCW^r \mid W \in (0+1)^*$ by empty stack, where W^r represent the reverse of W.

Assignments – 5

Q1. Design a Turing machine that can add two unary string separated by $.

Q2. Construct PDA for the following set:

$L = \{a^n b 2^n \mid n >= 1\}$

Q3. Convert the following grammar into GNF

$S \rightarrow AACD$

$A \rightarrow aAb \mid \epsilon$

$C \rightarrow aC \mid a$

$D \rightarrow aDa \mid bDb \mid \epsilon$

Q4. Write CFG for the following language and also draw the parse tree for a string "aaabbbbccccaaa"

$L = \{a^n b^m c^m a^n \mid n,m>=1\}$

Q5. Construct the regular expression for a language

$L = \{ a^n bb \mid n >=1\}$

Assignments – 6

Q1. Construct parse tree for the given grammar for a string "bbaaba"

$S \rightarrow aB \mid bA$

$A \rightarrow a \mid aS \mid bAA$

$B \rightarrow b \mid bS \mid aBB$

Q2. Find a CFG for each of the languages defined by the following regular expressions

i. ab* ii. a* b*

Q3. Convert the following PDA into CFG

$M = (\{q0, q1\}, \{0,1\}, \{z0, x\}, \delta, q0, z0, \phi)$

$\delta(q0,1,z0) = (q0, xz0),$

$\delta(q0, \epsilon, z0) = (q0, \epsilon),$

$\delta(q0,1,x) = (q0, xx)$

Q4. Convert the following grammar into GNF

$S \rightarrow AACD$

$A \rightarrow aAb \mid \epsilon$

$C \rightarrow aC \mid a$

$D \rightarrow aDa \mid bDb \mid \epsilon$

Q5. Construct DFA for the following regular expression.

01(0+1)*10

Assignments – 7

Q1. Define 2 Way Turing machine.

Q2. Define Context free Grammar with example.

Q3. What is regular grammar? Explain with the help of example, how regular grammar is converted into FSM.

Q4. Explain all the properties of CFL.

Q5. What are the different modifications on Turing Machine?