Progressive Education Society's
Modern College of Arts, Science & Commerce (Autonomous)
Ganeshkhind, Pune – 16
End Semester Examination: October 2024
Faculty: Science and Technology

Program : B.Sc.Computer Science
Program (Specific) : Computer Science
Code : (BScComp05)
Class : T.Y.B.Sc. Computer Science
Name of the Course : Theoretical Computer Science
Course Code : 24 CS 356

Semester : V
SET : A
Course Type : CC
Max.Marks: 35
Paper :
Time : 2Hrs

Instructions to the candidate:

1) ***There are 4 sections in the question paper. Write each section on a separate page.***
2) ***All Sections are compulsory.***
3) ***Figures to the right indicate full marks.***
4) ***Draw a well labeled diagram wherever necessary.***

SECTION : A

Q1) Solve the following Multiple-Choice Question [5*1=5]

1. Which is the string with zero occurrences of symbols?
   a. Full b. Finite
   c. Null d. Symbolic
2. A finite automata recognizes
   a. Context sensitive languages b. context free languages
   c. regular languages d. none of this
3. Which is the tree representation of deriving a CFL from a given context grammar ?
   a. Parse tree b. derivation tree
   c. both a and b d. None of this
4. Which machine accepts a context free language ?
   a. PDA b. FA
   c. DFA d. NFA
5. Melay machine gives the output on -----
   a. state b. transaction
   c. initial state d. final state

Q2) Attempt ANY FOUR of the following in one sentence: [4*1=4]

a. What is Prefix and suffix of a string?
b. Define regular expression.
c. What is right linear Grammar?
d. Why is PDA more Powerful than FA?
e. Give any two applications of the Turing machine.
f. What is a Moore Machine?

SECTION : B

Q3) Attempt ANY FOUR of the following: [4*2=8]

a. Differentiate between NFA and DFA.
b. Write regular expression for the set of all strings of ‘a ‘and ’ b ‘ starting with ‘aa’ and ending with ‘bba’.
c. Explain the properties of regular expression .
d. Show that the following CFG is ambiguous
   S->a/abSb |aAb
   A->bS |aAAb
e. Differentiate between PDA and NPDA.
f. Explain Null closure with an example.

SECTION : C

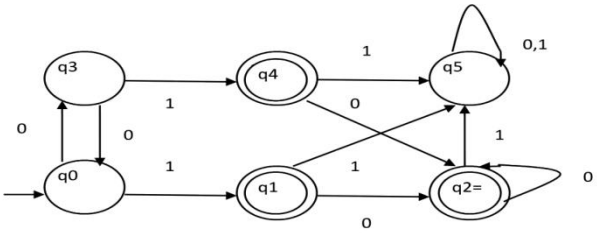
Q4) Attempt ANY FOUR of the following: 4*2=8]

a. Construct DFA containing all string starting with 1 and having 010 as a substring over set of alphabet (0,1)
b. Check whether the following language is regular or not using pumping lemma{ L= $a^n b^m$ |n>m}
c. Find CFG with no useless symbols equivalent to CFG given below
   S->AB |CA
   A->a
   B->BC | AB
   C->aB | b
d. Write a formal definition of DPDA and Turing Machine.
e. What are the types of grammar in the Chomsky hierarchy?
f. What is ambiguous grammar ?Explain with a diagram.

SECTION : D

Q5) Attempt ANY TWO of the following: [5*2=10]

a. Minimize the given DFA



b. Draw FA equivalent to regular expression RE= ab*(a=b)* +b(b+a)*bb*
c. Convert following CFG into CNF
   S->aAab | Aba
   A-> aS | bB
   B-> ASB | a
d. Construct PDA for language L={ $a^m b^m$ |m>1}