Unit - V

5. a) What is tractable and intractable problem?

   b) Explain NP class problem with suitable example?

   c) Give the non deterministic algorithm for sorting elements in non decreasing order.

   d) Prove that vertex cover problem is NP complete problem.

   OR

   Write short note:

   i) NP - Hard Problem

   ii) Travelling salesman problem

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Roll No ....

CS - 505

B.E. V Semester

Examination, December 2014

Theory of Computation

Time : Three Hours

Maximum Marks : 70

Note: i) Answer five questions. In each question part A, B, C is compulsory and D part has internal choice.

ii) All parts of each questions are to be attempted at one place.

iii) All questions carry equal marks, out of which part A and B (Max.50 words) carry 2 marks, part C (Max.100 words) carry 3 marks, part D (Max.400 words) carry 7 marks.

iv) Except numericals, Derivation, Design and Drawing etc.

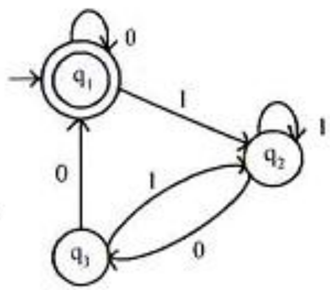
Unit - I

1. a) Write the definition of DFA?

   b) Construct a finite automata for the language $\{0^n \mid n \bmod 3=2, n\geq 0\}$.

   c) Prove $L = \{a^P \mid P \text{ is a prime}\}$ is not regular using pumping lemma.

   d) Find out the regular expression from given DFA.



OR

Construct DFA equivalent to the NFA.

$M = (\{p, q, r\}, \{0, 1\}, \delta, p, \{q, s\})$

where δ is defined in the following table.

δ	0	1
p	{q, s}	{q}
q	{r}	{q, r}
r	{s}	{p}
s	–	{p}

Unit - II

2. a) Find the CFG for the regular expression $(110+11)^*(10)^*$.

b) Show that the grammar $S \rightarrow a|abSb|aAb$, $A \rightarrow bS|aAAb$ is ambiguous.

c) Construct the reduced grammar equivalent to grammar

$S \rightarrow aAa$

$A \rightarrow Sb \mid bCC \mid DaA$

$C \rightarrow abb \mid DD$

$E \rightarrow aC$

$D \rightarrow aDA$

d) Convert the following CFG to CNF

$S \rightarrow ABA$

$A \rightarrow aA \mid \varepsilon$

$B \rightarrow bB \mid \varepsilon$

OR

Convert the following CFG to GNF

$A \rightarrow BC$

$B \rightarrow CA \mid b$

$C \rightarrow AB \mid a$

Unit - III

3. a) Give the definition of Pushdown Automata with the help of diagram.

b) Write the closure properties of CFL's.

c) Is it true that non deterministic PDA is more powerful than that of deterministic PDA? Justify your answer.

d) Construct PDA for the following language:

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

OR

Show that the language $\{a^{n^2} \mid n \geq 1\}$ is not context free.

Unit - IV

4. a) Explain the term recursively enumerable language.

b) Give short note on Post's correspondence problem.

c) What are the features of Universal turing machine?

d) Construct a tuning machine for a language having equal number of a's and b's in it over the input set $\Sigma = \{a, b\}$.

OR

Find the languages obtained from the following operations:

i) Union of two recursive languages.

ii) Union of two recursively enumerable languages.

iii) L if L and complement of L are recursively enumerable.