Code No: 134BD **R16**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B.Tech II Year II Semester Examinations, December - 2018
FORMAL LANGUAGES AND AUTOMATA THEORY
(Common to CSE, IT)

Time: 3 Hours **Max. Marks: 75**

Note: This question paper contains two parts A and B.
Part A is compulsory which carries 25 marks. Answer all questions in Part A.
Part B consists of 5 Units. Answer any one full question from each unit. Each question carries 10 marks and may have a, b, c as sub questions.

PART- A

(25 Marks)

1.a)	Define the central concepts of Automata Theory.	[2]
b)	Write down the applications of finite automata.	[3]
c)	Construct a regular grammar for L= $\{0^n11/n \geq 1\}$.	[2]
d)	Explain the applications of the pumping lemma.	[3]
e)	Define ambiguity in CFG with an example.	[2]
f)	Write short notes on Parse Trees.	[3]
g)	Construct CFG to generate string with any numbers of 1's.	[2]
h)	Write about the programming techniques for Turing Machines.	[3]
i)	Define undecidability. Give an example of an undecidable problems.	[2]
j)	Write short note on NP-hard problem.	[3]

PART-B

(50 Marks)

2.a) Differentiate between NFA and DFA.
b) Design DFA for the following over {a, b}
i) All strings containing not more than three a's.
ii) All strings that has at least two occurrences of b between any two occurrences of a. [5+5]

OR

3.a) Explain the procedure for converting DFA to NFA.
b) Briefly discuss about Finite Automata with Epsilon- Transitions. [5+5]

4.a) Define Regular Expression? Explain about the properties of Regular Expressions.
b) Construct a DFA for the Regular expression $(0+1)^*(00+11)(0+1)^*$. [5+5]

OR

5. Design a FA for the following languages
a) $\left(0^*1^*\right)^*$
b) $(0+1)^*\ 111^*$
c) (0* 11* + 101) [10]

6.a) Convert the following grammar to a PDA that accepts the language by empty stack
S → 0S1|A
A → 1A0 |S|€.

b) Show that for every PDA there exists a CFG such that L(G) = N(P). [5+5]

OR

7.a) Derive left and right most derivations for the input string a=b*c+d/e for the given Grammar.
E→E+E|E-E|E*E
E→E/E
E→(E)|id

b) Explain the followings with examples.
i) Sentential Forms
ii) Deterministic Pushdown Automata. [5+5]

8.a) Design a Turing Machine to accept the language L={wcw^R|w∈(a+b)*}.

b) Define Chomsky Normal Form (CNF). Convert the following grammar to CNF
S→0S0|1S1|∈ [5+5]

OR

9.a) Explain following:
i) Closure properties of Context Free Languages.
ii) Decision properties of Context Free Languages.

b) Design a Turing machine to recognize all strings consisting of odd numbers of 1's. [5+5]

10.a) Write the properties of recursive and non-recursive enumerable languages.

b) Let ἐ ={0,1} and A,B be the list of 3 strings each. Verify below PCP has a solution or not? [5+5]

	List A	List B
1	wi	xi
1	00	0
2	001	11
3	1000	011

OR

11.a) Give the correspondence between P,NP and NP-complete problems.

b) Define post`s correspondence problem and show that it is undecidable. [5+5]

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