Code No: 134BD **R16**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B.Tech II Year II Semester Examinations, May - 2019
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 as sub questions.

PART – A

(25 Marks)

1.a) Define Kleene Closure and Positive Closure? [2]
b) Define Moore Machine? [3]
c) Define a Regular Expression. [2]
d) Find the simplified regular expression for the following regular expression r (r*r + r*) + r*? [3]
e) Define Context Free Grammar. [2]
f) Define Push Down Automata. [3]
g) Define Turing machine. [2]
h) What is Chomsky Normal Form? [3]
i) What is undecidable problem? [2]
j) Compare recursive and recursive enumerable languages. [3]

PART – B

(50 Marks)

2. Construct NFA with ε which accepts a language consisting the strings of any number of 0's followed by any number of 1's followed by any number of 2's And also convert into NFA without ε transitions. [10]

OR

3. Construct the Moore machine to determine residue mod 3 and convert into Mealy machine. [10]

4.a) Test whether the following two FSM's are equivalent.

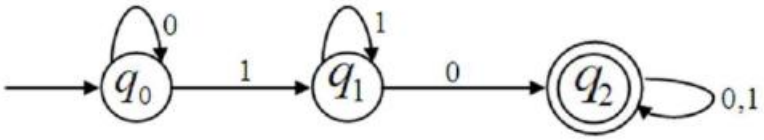
M1	0	1
→ A	B	D
(B)	A	C
C	D	B
(D)	C	A

M2	0	1
→ P	R	R
Q	R	P
(R)	P	Q

b) Apply pumping lemma for the language L={a^n/n is prime} and prove that it is not regular? [5+5]

OR

5. Construct the regular expression corresponding to the language accepted by following DFA. [10]



6.a) Elaborate on left most derivation and right most derivation.

b) Design Push down Automata for $L = \{a^{2n}b^n \mid n \geq 1\}$ 3. [5+5]

OR

7. Construct the CFG for the PDA $M = (\{q_0,q_1\}, \{0,1\}, \{R,Z_0\}, \delta, q_0, Z_0, \Phi)$ and δ is given by

$\delta(q_0,1,Z_0)=(q_0,RZ_0)$
$\delta(q_0,1,R)=(q_0,RR)$
$\delta(q_0,0,R)=(q_1,R)$
$\delta(q_1,0, Z_0)=(q_0, Z_0)$
$\delta(q_0,\varepsilon, Z_0)=(q_0,\varepsilon)$
$\delta(q_1,1,R)=(q_1,\varepsilon)$. [10]

8.a) List out and discuss the closure properties of CFL.

b) Construct CFG without ε – production from the one which is given below

$S \rightarrow a \mid Ab \mid aBa$
$A \rightarrow b \mid \varepsilon$
$B \rightarrow b \mid A$ [5+5]

OR

9. Design a Turing Machine to accept $L=\{WcW^R \mid W \text{ is in } (a+b)^*\}$. [10]

10.a) Discuss in brief about NP Hard problems.

b) Discuss the examples of undecidable problems. [5+5]

OR

11.a) Explain about the undecidable problems about turing machines.

b) Distinguish between class P and class NP Problems. [5+5]

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