

R16

Code No: 134BD

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.

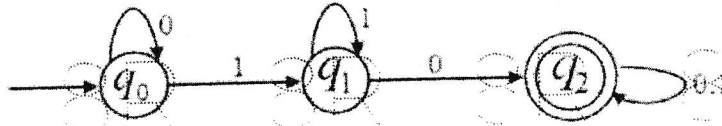
M1	0	1
\rightarrow A	B	D
(B)	A	C
C	D	B
(D)	C	A

M2	0	1
\rightarrow P	R	R
Q	R	P
(R)	P	Q

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

OR

- 5.5.a) Construct the regular expression corresponding to the language accepted by following DFA. [10]



- 6.a) Elaborate on left most derivation and right most derivation. [5+5]
 b) Design Push down Automata for $L = \{a^{2^n}b^n \mid n \geq 1\}$ 3.

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

- 8.a) List out and discuss the closure properties of CFL. [5+5]
 b) Construct CFG without ϵ - production from the one which is given below
- $S \rightarrow a \mid Ab \mid aBa$
 $A \rightarrow b \mid \epsilon$
 $B \rightarrow b \mid A$

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

OR

- 11.a) Explain about the undecidable problems about turing machines. [5+5]
 b) Distinguish between class P and class NP Problems.

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