

Code No: 155BK

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B. Tech III Year I Semester Examinations, August - 2022

FORMAL LANGUAGES AND AUTOMATA THEORY

(Common to CSE, IT, ITE)

Time: 3 Hours

Max. Marks: 75

Answer any five questions
All questions carry equal marks

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- 1.a) Differentiate between NFA and DFA.
b) Construct DFA for the following language:
i) $L = \{w | w \text{ has both an even number of 0's and even number of 1's}\}$
ii) $L = \{w | w \text{ is in the form of 'x01y' for some strings x and y consisting of 0's and 1's}\}$.
[5+10]
- 2.a) Design a Moore Machine to determine the residue mod 3, where input is treated as binary.
b) Construct the NFA accepting the following language:
i) The set of all strings over $\Sigma = \{a,b\}$ starting with the prefix "ab"
ii) The set of all strings over $\{0,1\}$ except those containing the substring "001". [7+8]
- 3.a) Construct the NFA for the regular expression $r = ((01+10)^*00)^*$.
b) What are the closure properties of regular languages?
c) State the Pumping Lemma for regular sets. [6+5+4]
- 4.a) Construct the regular expression for the language over the set $S = \{0,1\}$
i) The set of all strings containing no three consecutive 0's.
ii) The set of all strings in which the number of occurrences is divisible by 3.
b) Design NFA with epsilon for the $RE = (a/b)^*ab$ and convert it into DFA and further find the minimized DFA. [6+9]
- 5.a) What do you mean by ambiguity in grammars and languages? How to eliminated ambiguity in grammars? Explain with an example.
b) Consider the grammar $(\{S,A,B\}, \{a,b\}, P, S)$ that has the productions:
 $S \rightarrow bA \mid aB \quad A \rightarrow bAA \mid aS \mid a \quad B \rightarrow aBB \mid bS \mid b$.
Find an equivalent grammar in CNF. [7+8]
- 6.a) Construct the PDA for the following grammar:
 $S \rightarrow aAA, \quad A \rightarrow aS \mid bS \mid a$
b) Discuss the applications of Push down Automata. [8+7]
7. Explain the importance of Turing Machines and also give descriptions of various types of Turing Machines with necessary examples. [15]
8. Discuss briefly about decidability and undecidability problems. [15]

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