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10CS56

Fifth Semester B.E. Degree Examination, Dec.2019/Jan.2020
Formal Languages and Automata Theory

Time: 3 hrs. Max. Marks:100

Note: ***Answer any FIVE full questions, selecting at least TWO questions from each part.***

PART – A

1 a. Differentiate between DFA and NFA. Construct DFA to accept the following language. $L = \{\omega : |\omega| \bmod 3 \geq |\omega| \text{ and } 2\}$ where $\sum = \{a, b\}$. **(10 Marks)**

b. Write a procedure to convert NFA to equivalent DFA. convert the following NFA into equivalent DFA.

$\rightarrow q_0$	$\{q_0\}$	$\{q_0, q_1\}$
q_1	$\{q_2\}$	$\{q_2\}$
q_2	$\{q_3\}$	$\{q_3\}$
$*q_3$	ϕ	Φ

(10 Marks)

2 a. Define Regular expression. Write regular expression to accept the following languages $L = \{a^n b^m : n \geq 1, m \geq 1, nm \geq 3\}$ **(08 Marks)**

b. Show that every language defined by a regular expression is also defined by a finite automata. **(06 Marks)**

c. Discuss any three applications for Regular expressions. **(06 Marks)**

3 a. State pumping lemma for regular languages. Show that the following language is not regular. $L = \{0^n : n \text{ is prime number}\}$ **(06 Marks)**

b. If L and M are regular languages, show that $L \cap M$ is also regular. **(06 Marks)**

c. Minimize the following DFA using Table filling method. **(08 Marks)**

	0	1
$\rightarrow A$	B	A
B	A	C
C	D	B
* D	D	A
E	D	F
F	G	E
G	F	G
H	G	D

4 a. Define Context Free Grammar. Construct CFG for the following language. $L = \{0^i 0^j 0^k \mid j > i + k\}$ **(08 Marks)**

b. Write leftmost, derivation and construct parse tree for the string 'aabbbb' using the grammar
$S \rightarrow AB \mid \in$
$A \rightarrow aB$
$B \rightarrow Sb$ **(06 Marks)**

c. Define ambiguous grammar. Show that the following language is ambiguous.
$S \rightarrow SS/(S)/( )$ **(06 Marks)**

PART – B

5 a. Define push Down Automata. Construct NPDA for accepting the following language.
$L = \{\omega\omega^R : \omega \in \{a, b\}^*\}$
Show all ID's to process the string 'baab' **(14 Marks)**

b. Convert the grammar to equivalent PDA.
$S \rightarrow 0AA$
$A \rightarrow 0S \mid 1S \mid 0$ **(06 Marks)**

6 a. Convert the grammar into GNF.
$S \rightarrow AA \mid 0$
$A \rightarrow SS \mid 1$ **(08 Marks)**

b. Eliminate all $\in$ production from the grammar
$S \rightarrow ABC$
$A \rightarrow BC \mid a$
$B \rightarrow bAC \mid \in$
$C \rightarrow cAB \mid \in$ **(06 Marks)**

c. If L is a CEL and R is a regular language then show that $L \cap R$ is a CEL. **(06 Marks)**

7 a. Define Turning machine. Design Turing machine that accept the following language
$L = \{a^n b^n c^n : n \geq 1\}$ **(10 Marks)**

b. Write a note on :
i) Multiple Turing Machine
ii) Nondeterministic Turing Machine. **(10 Marks)**

8 a. Define Recursively Enumerable language. Prove that Diagnoalization in not recursively enumerable. **(08 Marks)**

b. Write a note on :
i) Recursive language
ii) Post's correspondence problem. **(12 Marks)**

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