MALNAD COLLEGE OF ENGG & TECHNOLOGY LIBRARY HASSAN

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10CS56

Fifth Semester B.E. Degree Examination, June/July 2017
Formal Languages and Automata Theory

Time: 3 hrs. Max. Marks:100

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

PART – A

1 a. Give Formal definition of DFA. And also Design a DFA to read a string made up of letters "computer" and recognize the strings that contains the word "cut" as a substring. **(10 Marks)**

b. Design a DFA to accept strings of a's and b's not ending with abb. **(05 Marks)**

c. Covert the following NFA to DFA **(05 Marks)**

δ	0	1
$\rightarrow q_0$	$\{q_0\}$	$\{q_0, q_1\}$
q_1	q_2	q_2
$*q_2$	ϕ	ϕ

2 a. Consider the following $\in$ – NFA

δ	$\in$	a	b
$\rightarrow$ P	{r}	{q}	{p, r}
q	Φ	{p}	Φ
*r	{p, q}	{r}	{p}

i) Compute the $\in$-closure of each state

ii) Give the set of all strings of length 3 or less accepted by the automation

iii) Convert the automation to DFA. **(08 Marks)**

b. Describe regular expression recursively. Write the regular expression for the following:

i) Strings of a's and b's that do not end with ab over $\{a, b\}^*$

ii) String of 0^s and 1^s such that starts and ends with the same symbol. **(06 Marks)**

c. Obtain regular expression from the following DFA using state elimination method. **(06 Marks)**

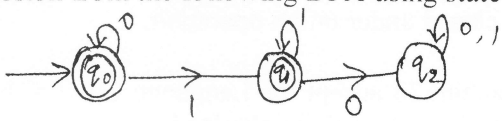

Fig Q2(c)

3 a. State and prove pumping lemma for regular languages. **(05 Marks)**

b. Prove that if L is a regular language so L^R. **(05 Marks)**

c. Minimize the following DFA using table filling Algorithm. **(10 Marks)**

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

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

4 a. Define context free grammar. Write a CFG for palindromes over $\{0, 1\}^*$. (05 Marks)

b. What is ambiguous grammar? Show that following grammar is ambiguous for the string "abababa". $S \rightarrow Sbs|a$ (05 Marks)

c. What is inherent ambiguity? Explain with an example. (05 Marks)

d. Explain the application of CFG with respect to parsers. (05 Marks)

PART – B

5 a. Explain the working of PDA with a diagram. (05 Marks)

b. Design a PDA for accepting the language $L = \{0^{2n}1^n | n \geq 1\}$. Draw the transition diagram for PDA obtained. Show the instantaneous description of the PDA for the string "000011". (10 Marks)

c. Convert the following grammar to PDA (05 Marks)

$I \rightarrow a|b|I_a|I_b|I_0|I_1$

$E \rightarrow I|E*E|E+E|(E)$.

6 a. Consider the following grammar

$S \rightarrow ASA|aB$

$A \rightarrow B|S$

$B \rightarrow b|E$

i) Eliminate E - production

ii) Eliminate any unit productions in the resulting grammar

iii) Eliminate any useless symbols in the resulting grammar

iv) Put the resulting grammar in to CNF. (10 Marks)

b. Show that $L = \{ 0^n1^n2^n \mid n \geq 1 \}$ is not context free. (06 Marks)

c. Prove that CFL are closed under union operation. (04 Marks)

7 a. Design a Turing machine to accept the Language $L = \{ a^n b^n c^n \mid n \geq 1\}$. Give the graphical representation for the Turing machine obtained. (12 Marks)

b. Define a Turing machine. Show that a multitape Turing machine is equivalent to a basic Turing machine. (08 Marks)

8 Write short notes on :

a. Recursively Enumerable Language

b. Post correspondence problem

c. Languages of PDA

d. Applications of regular expression. (20 Marks)

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