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Max. Marks: 70

B.Tech II Year II Semester (R13) Regular & Supplementary Examinations May/June 2016 FORMAL LANGUAGES & AUTOMATA THEORY

(Computer Science and Engineering)

Time: 3 hours

PART – A (Compulsory Question)

- 1 Answer the following: (10 X 02 = 20 Marks)
 - (a) Define the terms symbol, string and Language.
 - (b) Write short notes on proof by contradiction.
 - (c) Differentiate between Klean closure and positive closure.
 - (d) If R_1 and R_2 are two regular languages, $R_1 \cup R_2$ and $\overline{R_1}$ and $\overline{R_2}$ are also regular languages, prove by DeMorgans rules that $R_1 \cap R_2$ is also a regular language.
 - (e) For the grammar E→E+E, E→E*E, E→id, construct a parse tree (using leftmost derivation) for the string id*id*id+id.
 - (f) List the set operators under which CFLs are NOT CLOSED. Justify your answer.
 - (g) Explain how a stack is integrated into the functioning of a PDA.
 - (h) Give the formal definition of a PDA.
 - (i) Explain the functioning of a counter machine.
 - (j) State the closure properties of recursive languages.

PART – B

(Answer all five units, 5 X 10 = 50 Marks)

UNIT – I

- 2 (a) Construct the NFA for the RE (0+1)*(00+11) (01) (0+1)*.
 - (b) For the following ϵ -NFA, construct its equivalent NFA without ϵ transitions.



- 3 (a) Construct a Moore machine that takes strings comprising 0, 1, 2 and 3 as input (base 4 number) whose decimal equivalent modulo 7 is given as output.
 - (b) How do we determine equivalence of two DFA? Explain with an example

UNIT – II

- 4 (a) State and prove Arden's Theorem
 - (b) List the closure properties of Regular Languages

OR

5 Find the regular expression corresponding to the following DFA.



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Z→XY|b OR

- 7 (a) Explain the following terms with example:
 (i) Ambiguous Grammar.
 (ii) Left Recursion.
 (iii) Chomsky's Normal Form.
 - (b) Discuss the closure properties of Context free languages.

UNIT – IV

- 8 (a) Construct a PDA that recognizes strings (over alphabet 0 and 1) that contain equal number of 0s and 1s.
 - (b) Construct a grammar in Chomsky's Normal Form that is equivalent to: $A \rightarrow aBCb, B \rightarrow bC, C \rightarrow Cb, C \rightarrow b.$

OR

- 9 (a) Construct a PDA that recognizes strings of WW^r form, where W^r is the reverse of W, and strings comprise of 0s and 1s. Give the instantaneous of the PDA also.
 - (b) Construct a PDA that recognizes strings of type $0^{n}1^{m}$ | n>m using final state.

UNIT – V

- 10 (a) Explain the concept of Universal Turing Machine.
 - (b) Find a PCP solution for the following sets.

A	В	
ab	aba	
ba	abb	<u>,0</u> ,
b	ab	\cdot
abb	b	
а	bab	
	OR	

11 Construct a Turing Machine that computes the product of two numbers, represented in Unary form.

