Code: 9A05407

SS

B.Tech III Year I Semester (R09) Supplementary Examinations December 2015

FORMAL LANGUAGES & AUTOMATA THEORY

(Computer Science and Engineering)

Time: 3 hours Max Marks: 70

Answer any FIVE questions

All questions carry equal marks

*****

1 (a) Design NFA accepting all strings ending with 101 over $\Sigma = \{0, 1\}$.
(b) Construct a NFA in which triple '1' is followed by triple '0' over $\Sigma = \{0, 1\}$.

2 Prove the theorem "if L is accepted by an NFA with ε - transitions then L is accepted by an NFA without ε - transitions".

3 (a) Discuss the applications of a regular expression.
(b) Explain and prove 'if L_1 and L_2 are two languages then $L_1 U L_2$ is regular.

4 Discuss and explain the following:
(a) CFL are not closed under intersection and complementation.
(b) A regular grammar generates an empty string.
(c) A regular language is also context free but not reverse.

5 (a) Convert the CFG with the following productions into GNF.
$A \rightarrow 00A / B / 0 \quad B \rightarrow 1A1$
(b) Write procedure for eliminating unit productions from a given CFG. Eliminate unit productions from the following grammar.
$S \rightarrow A / B / Cc \quad A \rightarrow aBb / B$
$B \rightarrow aB / bb \quad C \rightarrow Cc / B$

6 (a) Show that if L is accepted by a PDA in which no symbols are ever removed from the stack, then L is regular.
(b) Design a PDA for recognizing $L = \{ a^i b^j / j <= i \text{ and } i, j > 0 \}$. Show the moves of the PDA for the string aabb.

7 (a) Design a TM for $L = \{ x \in \{a, b, c\}^* /$ no. of a's, no. of b's and no. of c's in x are equal}. Draw its transition diagram. Trace the moves of TM for abcabc.
(b) Discuss about any two modifications to the basic model of a TM.

8 Write short notes on:
(a) Turing reducibility.
(b) Chomsky hierarchy of languages.
(c) NP hard and NP complete problems.

*****