Roll No. .....

23067

M. Tech. 1st Semester (Computer Sc. Engg.) Examination–May, 2015

MATHEMATICAL FOUNDATION OF COMPUTER SCIENCE

Paper : MTCE-603-A

Time : 3 hours ***Max. Marks : 100***

Before answering the questions, candidates should ensure that they have been supplied the correct and complete question paper. No complaint in this regard will be entertained after the examination.

Note : Attempt any **five** questions. All questions carry equal marks.

1. (a) What do you mean by PDA ? How are PDA different from FA ? Also discuss some applications of PDA.

(b) Design a pushdown automata for the following language = ($a^n b^{2n}$: n > 0)

2. (a) Design a Turning Machine to accept the language L = {0^n/n ≥ 1}

(b) Discuss Halting problem of Turning machine.

3. (a) Let G be S→AB, A→a, B→C|b, C→D, D→E and E→a. Eliminate unit production and get an equivalent grammar.

(b) Reduce the following grammar to CNF S→ASA|bA, A→B|S, B→c.

4. (a) Using the concept of Pumping Lemma prove that the set L = (0'1'|i>=1) is not regular

(b) State and prove Rice's theorem.

5. What is primitive recursive function ? Explain. Show that $f(x,y) = x + y$ is a primitive recursive function.

6. Write and briefly explain the characteristics of each class of grammar classified according to Chowmsky Hierarchy. Determine the type of the grammar G.

   (i) $S \rightarrow aA, A \rightarrow aAB, B \rightarrow b, A \rightarrow a$

   (ii) $S \rightarrow aAB, AB \rightarrow C, A \rightarrow b, B \rightarrow AB$

7. Explain :

   (i) Linear bounded Automata

   (ii) Universal Turing Machine

8. (a) Construct FA equivalent to following regular expression : $(0 + 1)^* (00 + 11) (0 + 1)^*$

(b) What is the difference between NFA and DFA. Given NFA is

δ/Σ	A	b
$\rightarrow q_0$	(q_0, q_1)	(q_2)
q_1	(q_0)	(q_1)
q_2	∅	(q_0, q_1)

Convert it into DFA.
