

SECTION - C

6. (a) Design a TM that accept the language of Palindrome (both even and odd length) (12)
(b) Write short notes on Halting problem of TM. (8)
7. (a) Design a TM to accept the language. (10)
 $L = \{0^n 1^{2n} | n \geq 1\}$
(b) Design a two-track TM to multiply two positive integers. (10)

SECTION - D

8. (a) Explain primitive recursive function with example. (10)
(b) Show that the function $f(x,y) = x*y$ is primitive recursive. (10)
9. (a) Write short notes on : (3 × 4 = 12)
(i) Undecidable language
(ii) Reduction
(iii) Computability
(b) Write a short note on PCP problem. (8)

Roll No.

22642

M.Tech, 1st Semester (CSE) – CBCS Scheme Examination– December, 2016

MATHEMATICAL FOUNDATION OF COMPUTER SCIENCE

Paper : MTCSE21C5

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 **five** questions in all. Q. No. 1 is **compulsory**. Attempt atleast **one** question from each Section.

1. Explain the following :

- (a) Chomsky classification of grammar (5)
(b) Multiple TM (5)
(c) Parsing techniques (5)
(d) Church Turing thesis (5)

SECTION - A

2. (a) Construct a nondeterministic finite automation accepting the set of all strings over $\{a,b\}$ ending in aba. Use it to construct a DFA accepting the same set of strings. (10)

- (b) Prove that the class of regular languages is closed under union operation. (10)

3. (a) Convert the following grammar in Chomsky normal form (10)

$$S \rightarrow bA \mid aB$$

$$A \rightarrow bAA \mid as \mid a$$

$$B \rightarrow aBB \mid bs \mid b$$

- (b) Convert the following grammar to Greibach normal form. (10)

$$S \rightarrow AA \mid 0$$

$$A \rightarrow SS \mid 1$$

SECTION - B

4. (a) Construct a PDA accepting $\{a^n b^m a^n \mid m, n \geq 1\}$ by null store. Construct the corresponding context free grammar accepting the same set. (10)

- (b) What do you mean by PDA ? How are PDA different from FA ? Also discuss some applications of PDA. (10)

5. (a) Let G be the grammar : (10)

$$S \rightarrow aB \mid bA$$

$$A \rightarrow a \mid as \mid bAA$$

$$B \rightarrow b \mid bs \mid aBB$$

For the string aaabbabbba find

(i) Leftmost derivation

(ii) Parse Tree

- (b) Construct a PDA A accepting the set of all strings over $\{a,b\}$ with equal no. of a's and b's. (10)