

SECTION C

6. (a) Design a TM that accepts the language of even and odd length Palindrome (both) (12)
- (b) Write short note on TM. Halting problem of TM. (8)
7. (a) Design a TM to accept the language $L = \{0^n 1^{2n} | n \geq 1\}$ (10)
- (b) Design a two-tape 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 (3 × 4 = 12)
- (i) Undecidable language
 - (ii) Reduction
 - (iii) Computability
- (b) Write a short note on CP 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 at least **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 non-deterministic finite automaton 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 set of regular languages is closed under concatenation 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 $\{a^m b^n \mid m, n \geq 1\}$ 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)