

Total No. of Questions :10]

SEAT No. :

**P3635**

**[5560]-591**

[Total No. of Pages : 3

**T.E. (I. T.)**

**THEORY OF COMPUTATION**  
**(Semester-I) (314441) (2015 Pattern)**

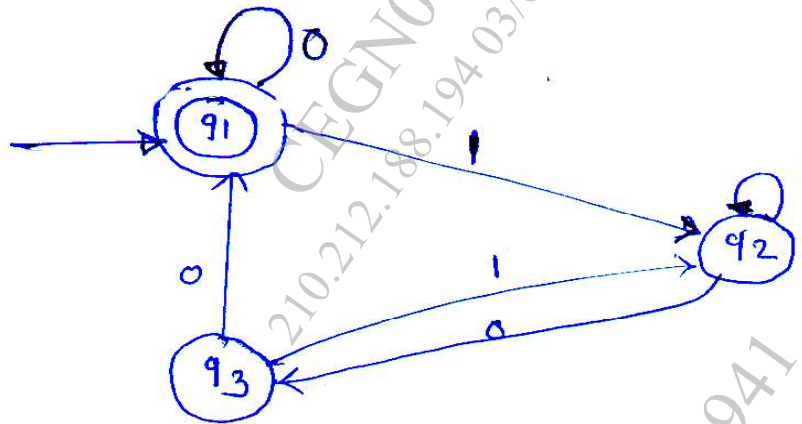
*Time : 2½ Hours]*

*[Max. Marks : 70*

*Instructions to the candidates:*

- 1) Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8, Q9 or Q10.
- 2) Neat diagram must be drawn wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Assume suitable data if necessary.

- Q1)** a) Design FA that rear string made up of letters in the word 'CHARIOT' and accept those string that contain 'CAT' as a substring. [5]
- b) Find out the regular Expression from given transition diagram (FA) by using Arden's theorem. [5]



OR

- Q2)** a) Show that  $L = \{0^i1^i \mid i \geq 1\}$  is not regular, by using pumping lemma. [6]
- b) Define - (i) Language- [4]
- With an
- Example- (ii) Regular Expression

**P.T.O.**

**Q3) a)** Find out the CFG From given language “L contains the strings consisting of a’s and b’s with at least two a’s” . [2]

b) Find the CFL associated with given CFG. [3]

$S \rightarrow a A / 1/B$

$A \rightarrow 1B / 1$

$B \rightarrow 0A / 0$

b) Convert the following grammar into (CFF). [5]

$S \rightarrow ABA$

$A \rightarrow a A / \epsilon$

$B \rightarrow b B / \epsilon$

OR

**Q4) a)** Write a short Note on Chansky Hierarch with an example. [4]

b) Check whether the following grammar is ambiguous or Not, if it is ambiguous, remove the ambiguity & write an equivalent ambiguous grammar. [6]

$S \rightarrow i C t s / i C t s C S$

$C \rightarrow b, S \rightarrow a$

**Q5) a)** Construct PDA for following language. [8]

$L = \{ 0^n 1^m 2^n \mid n, m \geq 0 \}$

b) Design post machine for language. [8]

$L = \{ a^n b^n \mid n \geq 1 \}$

OR

**Q6) a)** Obtain PDA for given grammar [10]

$S \rightarrow a ABC$

$A \rightarrow aB|a$

$B \rightarrow bA|b$

$C \rightarrow a$

Design PDA for following language.

b)  $L = \{ a^n b^n c^m d^m \mid n, m \geq 1 \}$  [6]

- Q7) a)** Design a TM that multiplies two unary numbers over  $\Sigma = \{a\}$  [10]  
 Write simulation for (i) aa & aaa  
 (ii) aaa & aaa

- b)** Explain the halting problem in TM. [8]

OR

- Q8) a)** Construct TM for the language. [10]  
 $L = \{a^n b^n c^n \mid n > 0\}$   
 show simulation for (i) aabbcc (ii) abcccc

- b)** Compare FM, PDA, PM, & TM with respect to language grammar, powerfulness and example. [8]

- Q9) a)** Prove that following are decidable languages. [10]

i)  $ACFG = \{(G, W) \mid \text{The context sensitive grammar } G \text{ accepts the input string } W\}$ .

ii)  $ADFA = \{(B, W) \mid B \text{ accepts the input string } W\}$

- b)** Prove that pcp with two lists  $x = (01, 1, 1)$   
 $y = (01^2, 10, 1^1)$  has no solution. [6]

OR

- Q10) a)** Show that  $HALT_{TM} = \{(M, W) \mid \text{The turing Machine } M \text{ halts on input } W\}$  is undecidable. [8]

- b)** Prove that “It is undecidable whether a CFG is ambiguous”. [8]

