

TCS-403

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Roll No. to be filled in your Answer Book

Roll No.

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B. Tech. (Computer Science Engineering)
(4TH Semester) Examination, 2015

Theory of Automata**Time: 3.00 Hrs]****[Max. Marks: 100****Note: All questions are compulsory**

Q.1 (attempt any four)

5*4=20

- Compare and contrast Finite Automaton, Push Down Automaton and Turing Machine?
- Explain Context free grammar with suitable examples.
- Differentiate between DFA and NFA using two suitable examples.
- Prove or disprove regularity of language $L = \{0^n 1^n \mid n \geq 0\}$ using pumping lemma.
- What do you understand by ambiguous grammar? Explain with suitable example.

f) Construct a Moore machine which is equivalent to the Mealy machine defined by table given below

Present states	For Input a=0		For Input a=1	
	state	Output	state	output
q ₁	q ₃	1	q ₂	1
q ₂	q ₁	0	q ₄	1
q ₃	q ₂	0	q ₁	1
q ₄	q ₄	0	q ₃	1

Q.2 (Attempt any four)-

a) What do you mean by halting problem of machine.

b) Explain Left most derivation and Right derivation for following grammar by using suitable string.

$$S \rightarrow S+G/G$$

$$G^* \rightarrow G^*Z/Z/id$$

$$Z \rightarrow (S^*G)/G$$

c) Design DFA for language L over {0,1} such that every string in L start with 101 and end with 1

- d) Convert the NFA given in following table to its corresponding DFA. Here q_0 is initial and q_2, q_4 are final states.

State	Input	
	a	b
$\rightarrow q_0$	$q_0 q_2$	$q_3 q_1$
q_1	$q_2 q_3$	$q_1 q_0$
q_2^*	$q_3 q_2$	q_4
q_3	$q_0 q_1 q_2$	$q_0 q_3 q_4$
q_4^*	q_0	$q_4 q_2$

- e) Construct NFA for the set of all strings over the alphabet $\{0, 1\}$, where 5th symbol from right is a '1'.
- f) Define Deterministic finite automata and its tuples with suitable example.

Q.3 (attempt any TWO)-

10*2=20

- a) Construct PDA that recognizes the language

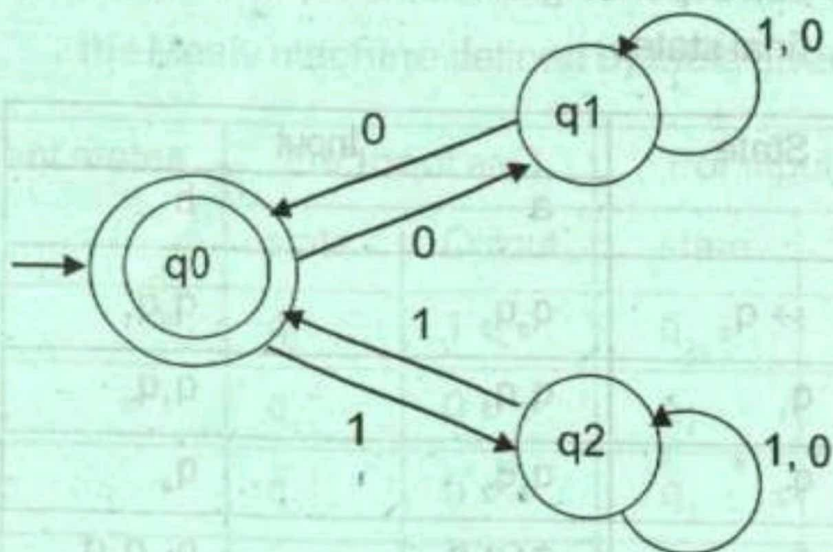
$$L = \{wcw^r \mid w \in \{a, b\}^*\}$$

- b) Construct Turing Machine which works as a copying machine for

$$W \in (a, b)^*$$

- c) Find the regular expression corresponding to the finite automaton given below using Arden's theorem.

DFA:



Q.4 (attempt any TWO)-

10*2:

- What do you mean by Turing Machine? Explain suitable example.
- Design two parse trees for following grammar using two suitable strings having different length

$$E \rightarrow [E+T]/T$$

$$T \rightarrow T * F / F$$

$$F \rightarrow \{E + F\} * F / id$$

- Construct a minimum state automaton equivalent to given automaton M whose transition table is defined by table given below. Here q_0 is initial and q_6, q_9 final states.

State	Input	
	a	b
q_0	q_0	q_3
q_1	q_2	q_5
q_2	q_3	q_4
q_3	q_0	q_5
q_4	q_0	q_6
q_5	q_1	q_7
q_6	q_1	q_3
q_7	q_0	q_5

Q.5 (attempt any TWO)-

0*2=20

- What is decidability? Explain any two undecidable problems.
- Reduce following grammar and convert it to Chomsky Normal Form(CNF).
 $E \rightarrow E+T/T$
 $T \rightarrow T * F/F$
 $F \rightarrow id / (E)$
- Explain pumping lemma for context free language with suitable example.