

**Hall Ticket Number:**

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**II/IV B.Tech(Regular/Supplementary) DEGREE EXAMINATION****April, 2017****Fourth Semester****Time:** Three Hours**Information Technology****Automata Theory & Formal Languages****Maximum : 60 Marks***Answer Question No.1 compulsorily.*

(1X12 = 12 Marks)

*Answer ONE question from each unit.*

(4X12=48 Marks)

1. Answer all questions

(1X12=12 Marks)

- Define NFA.
- What is the relation between  $\Sigma^* = \Sigma^+$  ?
- What is regular expression? Give a suitable example.
- Write the number of states in a smallest FA which accepts the language  $\{x/\text{length of } x \text{ is divisible by } 3\}$
- Define CFL.
- Is  $(r^*)^* = r^*$  ?
- What is meant by ambiguous grammar?
- Explain the term satisfiability in TM.
- How many ways can PDA accepts the string?
- Why computability functions are needed in the context of TM?
- Define Pumping lemma.
- Define a Turing machine

**UNIT I**

- Design DFA to accept the language  $L$  where  $L = \{w/w \text{ has both an even number of } 0\text{'s and even number of } 1\text{'s}\}$ . 6M
- Let  $L$  (language) be a set accepted by NFA. Show that there exists a DFA that accepts  $L$ . 6M

**(OR)**

- Construct a DFA equivalent to the NFA given by  $M = (\{p,q,r,s\}, \{0,1\}, \delta, p, \{s\})$ , where  $\delta$  is defined in the following table

$\delta$	0	1
p	$\{p,q\}$	$\{p\}$
q	$\{r\}$	$\{r\}$
r	$\{s\}$	$\{s\}$
s	$\{s\}$	$\{s\}$

6M

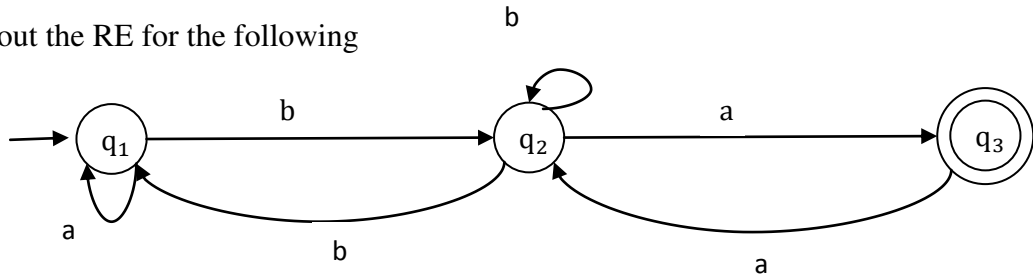
- Design  $\epsilon$ -NFA for the following language. Try to use  $\epsilon$ -transitions to simplify your design. "the set of strings consisting zero or more a's followed by zero or more b's followed by zero or more c's."

**UNIT II**

- Show that  $L = \{0^n 10^{2n} / n \geq 0\}$  is not regular. 6M

b.

Find out the RE for the following



(OR)

5. a. Construct an FA for RE  $10 + (0 + 11)0^*1$  6M
- b. Discuss briefly the algebraic law's for regular expressions. 6M

### UNIT III

6. a) Let G be the grammar  $S \rightarrow aB/bA$   
 $A \rightarrow a/aS/bAA$   
 $B \rightarrow b/bS/aBB$ .  
 For the string 'aabbabab' find (i) right most derivation (ii) derivation tree. 6M

- b) Explain context free grammar. Construct a CFG generating all integers (with sign). 6M

(OR)

7. a. Convert the following grammar into CNF from  $G = (\{S,A,B\}, \{a,b,c\}, p, S)$  productions are  $S \rightarrow ABa$   
 $A \rightarrow aab$   
 $B \rightarrow Ac$  6M
- b. Construct a PDA that accepts the language  $L = \{WCW^T / W \in \{a,b\}^*\}$ . 6M

### UNIT IV

8. a) Discuss about the Turing machine in detail. 6M
- b) Design a Turing machine for the language  $L = \{a^n b^{2n} / n \geq 1\}$ . 6M

(OR)

9. a. Write short notes on recursively enumerable languages. 6M
- b. State and explain post correspondence problem with suitable example 6M