**DHARMSINH DESAI UNIVERSITY, NADIAD**
**FACULTY OF TECHNOLOGY**
**B.TECH. SEMESTER VI [CE\IT]**
**SUBJECT: (CT614) THEORY OF AUTOMATA AND FORMAL LANGUAGES**

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| **Examination** | **: Second Sessional** | **Seat No.** | **: __________** |
| **Date** | **: 15/02/2014** | **Day** | **: Saturday** |
| **Time** | **: 12.45 to 2.00** | **Max. Marks** | **: 36** |

**INSTRUCTIONS:**
1. Figures to the right indicate maximum marks for that question.
2. The symbols used carry their usual meanings.
3. Assume suitable data, if required & mention them clearly.
4. Draw neat sketches wherever necessary.

**Q.1 Do as directed.**

(a) Define : Distinguishable strings with respect to L. **[2]**

(b) Suppose $L \subseteq \sum^*$ is a regular language. If every FA accepting L has at least n states, then every NFA accepting L has at least _______ states. (Fill in the blank, and explain your answer.) **[2]**

(c) Find all possible languages $L \subseteq \{a,b\}^*$ for which $I_L$ has 3 equivalence classes : the set of all strings ending in b, set of all strings ending in ba, and set of all strings ending in neither b nor ba. **[2]**

(d) State True/False with justification: **[2]**
If $L1 \subseteq L2$ and L2 non-regular, then L1 is non-regular.

(e) Ambiguity is a property of the grammar rather than the language. Explain this statement with example. **[2]**

(f) Every regular language is a CFL. State True/False with justification. **[2]**

**Q.2** Attempt ***Any Two*** from the following questions. **[12]**

(a) Using pumping Lemma show that language L is not a regular language.
$L = \{xy \mid x,y \text{ belongs to } \{0,1\}^* \text{ and } y \text{ is either } x \text{ or } x^r\}$

(b) Minimize the Finite Automata given in **Fig 1.**

(c) Generate a CFG for the language $L=\{a^i b^j c^k \mid i \neq j+k\}$

**Q.3** (a) Convert the following Grammar into Chomsky-Normal Form **[6]**

$S \rightarrow A \mid B \mid C$
$A \rightarrow aAa \mid B$
$B \rightarrow bB \mid bb$
$C \rightarrow aCaa \mid D$
$D \rightarrow baD \mid abD \mid aa$

(b) Convert following NFA-^ to DFA given in **Fig 2.** **[6]**

**OR**

**Q.3** (a) State Kleene's theorem Part-I and prove it using structural induction. **[6]**

(b) Suppose L1 and L2 are subsets of {0, 1}*. Design an FA that accept language $L1 \cap L2$. **[6]**

$L1 = \{x \mid x \text{ do not end with } 01\}$
$L2 = \{x \mid 00 \text{ is not a substring of } x\}$

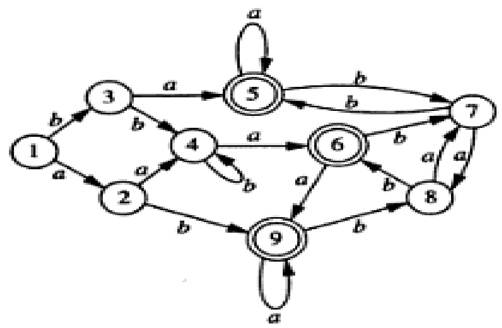

**Fig 1**

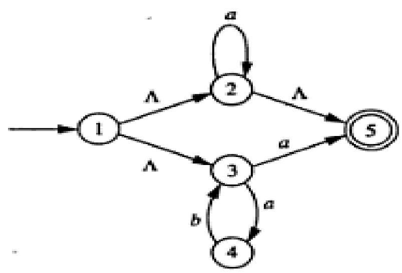

**Fig 2**