DHARMSINH DESAI UNIVERSITY, NADIAD
FACULTY OF TECHNOLOGY
B.TECH - Semester – VI(CE/IT)
SUBJECT: (CT614)THEORY OF AUTOMATA AND FORMAL LANGUAGES

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.

Examination	**: 1st Sessional**	**Seat No.**	**:**
Date	**: 22-01-2016**	**Day**	**: Friday**
Time	**: 12:30 P.M. TO 1:45 P.M.**	**Max. Marks**	**: 36**

Q.1 Answer the following: **[12]**

a) State True /False with justification [02]
"Structural induction is more powerful than conventional principle of Mathematical induction".

b) Give recursive definition of Finite Subsets of the Natural Numbers. [02]

c) Using proof by contrapositive Prove that for all integers n, if n^2 is odd then n is odd. [02]

d) Define Acceptance State for $L_1 \cup L_2$, $L_1 \cap L_2$ AND $L_1 - L_2$. Here, L_1 and L_2 are regular languages [02]

e) Justify: Set of positive integers (N) is closed under the operation of Addition [02]

f) Construct a relation on {1, 2, 3} that satisfies below given property {Reflexive, Not Symmetric, Transitive} [02]

Q.2 Answer the following: (*Any two)* **[12]**

a) Using proof by contradiction Prove that if a, b and c are integers and $a^2 + b^2 = c^2$, then at least one of a and b is even. [06]

b) Write down Principle of Mathematical Induction. Prove that $2^n > n^3$ for all $n \geq 10$. [06]

c) Define length function recursively and using the definition prove that for x, y belongs to Σ^*, $|xy| = |x| + |y|$ [06]

Q.3 Attempt the following: **[12]**

a) Consider Language L={awa| w belongs to {a,b}*}. [04]
1) Find L^2 Language.
2) Construct Deterministic Finite Automata for L^2

b) Find regular expressions for below given language [04]
1)Language of all strings containing the substrings 00 and 11
2) Real Literals in Pascal

c) Construct a Deterministic Finite Automata (**minimum state**) for given Language [04]
L_2={x belongs to {0,1}* | |x| >=2 and 2nd symbol from right in x is 1}

OR

Q.3 Attempt the following: **[12]**

a) Construct Deterministic Finite automata for (1+10+110)*0 [04]

b) Define following terms [04]
1)Deterministic Finite Automata
2) The Extended transition function δ*

c) Construct a Deterministic Finite Automata for below given Language [04]
L={x belongs to {0,1}* | x is a palindrome of length exactly 3}