Reg No.										

प्रज्ञानं ब्रह्म
Manipal
INSPIRED BY LIFE

MANIPAL INSTITUTE OF TECHNOLOGY
(Constituent Institute of MAHE- Deemed University)
MANIPAL-576104

V SEMESTER B.E. (CSE)
Date .06

SUBJECT**: Theory of Computation**

TIME :3 HOUR MAX.MARKS : 50

Instructions to Candidates

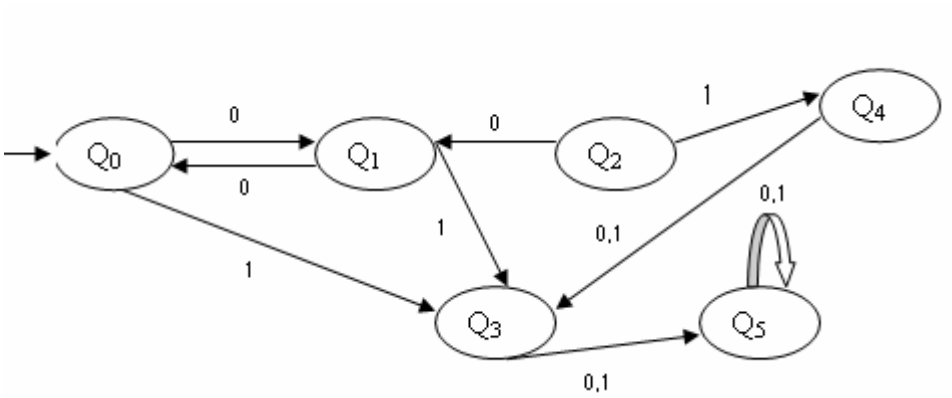
1. Answer **Any Five** questions.
2. Mention Clearly each step involved in solving the problem.
3. Answer to the point and avoid unnecessary explanation.

1A. Prove that by induction $1+3+5+\ldots\ldots+ r = n^2$ for all n>0, where r is an odd integer and n is the number of terms in the sum. 3Marks

1B. Construct an NFA accepting strings that have a 1 either 3 or 4 positions from the end hence find regular expression. 4Marks

1C. Design a finite automaton which checks whether a given decimal number is divisible by three. 3 Marks

2A. Minimize the states in the following deterministic finite automaton (DFA) depicted in the following diagram. Where Q_3 and Q_5 are final states and Q0 is the initial state of the following DFA.



4Marks

2B. Find a regular expressions for the language
L= {w € {a, b}*: Number of a's in w is even and number of b's in w is odd}
by reducing equivalent generalized transition graph. 3Marks

2C. State and prove Pumping Lemma for regular languages.
3Marks

3A. Find an s-grammar for L= { $a^n b^n$ | n ≥0 } 2 Marks

3B. Remove all undesirable productions from the following grammar.

S→aA | aBB,
A→aaA| λ
B→bC|bbC,
C→B.

What language does this grammar generate? 4 Marks

3C Explain the concept of an Exhaustive Search Parsing method.
4 Marks

4A. Construct an NPDA for accepting the language
L={ wcw^R | w €{a,b}* } 3 Marks

4B.State Pumping Lemma and hence prove that
L= { **$a^{n!}$ | n ≥1 }** is not a context free language. 4Marks

4C.Prove that family of context free languages is closed under union 3 Marks

5A.Design a Turing Machine to compute the function
f(w) = w^R where w €{0, 1}$^+$ 3 Marks

5B.Prove that class of Off Line Turing machines is equivalent to class of Standard Turing Machines. 4 Marks

5C. Discuss the concept of Universal Turing Machine 3 Marks

6A. Let S be an infinite countable set. Then prove that its power set is not countable.
4 Marks

6B. Define Context sensitive language and give one example for the same. 3 Marks

6C. Write a short note on Turing Machine Halting problem. 3 Marks