TRIBHUVAN UNIVERSITY

INSTITUTE OF ENGINEERING

Examination Control Division

2081 Chaitra

B

Exam.	Regular (New Course)		
Level	BE	**Full Marks**	60
Programme	BCT	**Pass Marks**	24
Year / Part	II / I	**Time**	3 hrs.

Subject: - Theory of Computation *(ENCT 203)*

- ✓ *Candidates are required to give their answers in their own words as far as practicable.*
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. a) State Diagonalization principle. Using the principle of mathematical induction. [1+3]

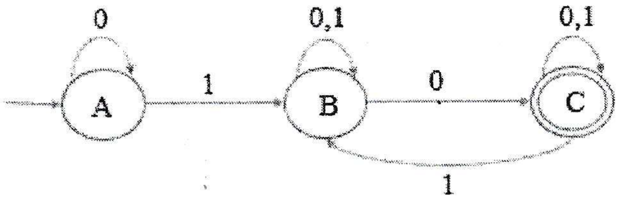
   Show that $1^3 + 2^3 + 3^3 \ldots\ldots\ldots\ldots\ldots + n^3 = \left[\frac{n(n+1)}{2}\right]^2$.

   b) Using rules of inference, show that the premises "If you send me an e-mail message, then I will finish writing the program," "If you do not send me an e-mail message, then I will go to sleep early," and "If I go to sleep early, then I will wake up feeling refreshed" lead to the conclusion "If I do not finish writing the program, then I will wake up feeling refreshed." [3]

   c) What are power of an alphabet and positive closure of an alphabet? [2]

2. a) Explain the processing of a string by finite automata along with its block diagram. Construct DFA that accepts all the string that doesn't contain two consecutive b over $\sum(a, b)$ and process the string w = baaaababb. [2+3]

   b) Write down the procedure to check the equivalence of two automata. Convert the given NFA into equivalent DFA. [1+4]



   c) Explain the decision properties of regular languages. [3]

3. a) Construct CFG for the language L: $a^n b^m c^m d^n$. Test your grammar to generate w = aabbbcccdd and draw parse tree for the same. [4]

   b) Convert the following CFG, into CNF: G = (V, Σ, R, S) where V = {S, A, B}, Σ = {a, b}, R = {S→A, S→B, A→aBa, A→ε, B→bAb, B→ ε } and S is starting symbol. [5]

   c) State pumping lemma for context free language and show that L={ww | where w = {0,1}* is not CFL. [4]

4. a) Design a TM that recognize the L ={$a^n c b^n$}. Also show how the string w = aaaacbbbb is accepted by your Turing machine. [6]

   b) Design a Turing machine that can compute a function f(x) = 2x [4]

   c) Explain the properties of recursive language. [4]

5. a) How encoding is done in Turing Machine? Explain. [3]

   b) Explain NP-Complete problems. [2]

6. a) How lexical analyzer and DFA related with each other? Explain with an appropriate example. [3]

   b) Construct the parse tree for the following. [3]