Tribhuwan University
Institute of Science and Technology
2076

Bachelor Level / fourth-semester / Science Full marks: 80 **Computer Science and Information Technology(CSC257)** Pass marks: 32 (Theory of Computation) Time: 3 hours Candidates are required to give their answers in their own words as far as practicable.
The figures in the margin indicate full marks.

Attempt all the questions.

Group A (8x4=32)

1. Define DFA and explain how it differs from NFA.

2. Define the term: alphabet, substring/Prefix/Suffix of a string with example.

3. What do you mean by ε-closure of a state in NFA with epsilon moves? Explain with an example.

4. Give the regular expression for the following languages over alphabet {a, b}

a. Set of all strings ending with substring ab.

b. Set of all strings with the 2nd and 4^{th} symbol is b.

5. What do you mean by CNF grammar? Convert the following grammar into CNF.

$S \rightarrow ABa, A \rightarrow aab, B \rightarrow AC$

6. Construct a PDA accepting L={w | w has equal no. of a's and b's}.

7. Describe the Turing machine. Construct a TM that accepts even length strings from the alphabet {0,

1}. 8. What do you mean by Intractability? Explain in brief.

Group B (6x8=48)

9. Explain about subset construction methods to convert a NFA into equivalent DFA with suitable

examples

. 10. State and prove the pumping lemma for regular language. Explain about its application.

11. Explain about the closure properties of regular languages. Show that for any regular languages L_1 and L_2, $L_1 \cup L_2$ is also regular.

12. What is regular grammar? Explain with example, about the method of converting a regular grammar into equivalent Finite Automata.

13. Define PDA. Explain how a PDA accepting by empty stack is converted into an equivalent PDA accepting the same language by final state.

14. What is the Universal Turing machine? Explain about the working mechanism of the Universal Turing machine for processing the binary code input for (T, w) where T is a specific Turing machine and w is input to T.