Bachelor Level / fourth-semester / Science Full marks: 60 **Computer Science and Information Technology(CSC257)** Pass marks: 24 (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.

Section A

Long Answer Questions.

Attempt any Two questions. (2x10=20)

1. Give the formal definition of DFA and NFA. How can NFA be converted into equivalent DFA? Explain with suitable examples.

2. Find the minimum state DFA for the given DFA below.

States	Inputs	
	0	1
→A	B	F
B	E	C
C	B	D
*D	E	F
E	B	C
F	B	A

3. Construct a Turing Machine that accepts the language of odd length strings over alphabet {a, b}. Give the complete encoding for this TM as well as its input string w = abb in binary alphabet that is recognized by Universal Turing Machine.

Section B

Short Answer Questions.

Attempt any Eight questions. (8x5=40)

4. Define the term alphabet, prefix and suffix of string, concatenation and Kleen closure with example.

5. Give the regular expressions for the following language over alphabet{a,b},

   a. Set of all strings with substring bab ar abb

   b. Set of all strings whose 3rd symbol is 'a' and 5th symbol is 'b'

6. Show that L = {a^n | n is a prime number} is not a regular language.

7. Explain about the Chomsky's Hierarchy about the language and grammars.

8. Define a Push Down Automata. Construct a PDA that accept L = {a^{n}b^n | n>=0}.

9. Convert the following grammar into Chomsky Normal Form.

   S → abSb | a | aAb

   A → bS | aAAb | ε

10. Define Turing Machine and explain its different variations.

11. What do you mean by computational Complexity? Explain about the time and space complexity of a Turing machine.

12. Explain the term Intractability. Is the SAT problem intractable? Justify.