

2022
B.A./B.Sc.
Fifth Semester
 CORE – 12
COMPUTER SCIENCE
Course Code: CSC 5.21
 (Theory of Computation)

Total Mark: 70

Pass Mark: 28

Time: 3 hours

Answer five questions, taking one from each unit.

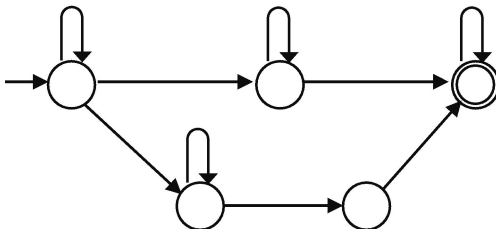
UNIT-I

1. (a) Write a note on automated theory? Define symbol and alphabet. 4+2=6
 (b) Explain computability theory and complexity theory. 4
 (c) Explain Kleene star and Kleene plus with example. 4

2. (a) Explain theory of computation. 4
 (b) Define string, empty string, length of string and power of an alphabet. 4
 (c) Explain the various set operations on a language. 6

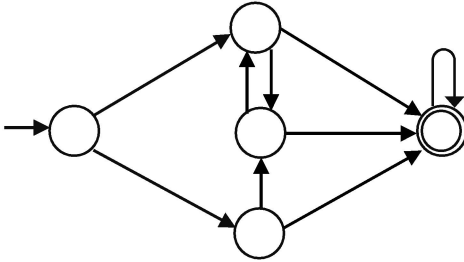
UNIT-II

3. (a) Give the formal definition an automaton? 4
 (b) Convert the below NFA to DFA: 5



(c) Minimize the given DFA:

5

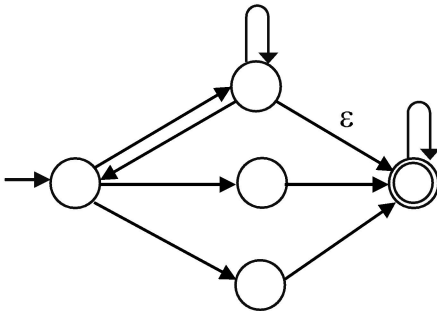


4. (a) Give the formal definition of NFA.

4

(b) Convert the given ϵ -NFA to DFA:

10



UNIT-III

5. (a) Define a regular grammar.

4

(b) Construct a CFG over the language $L = \{a^n b^{2n}, n \geq 1\}$

4

(c) Prove that a language $L = \{a^n b^n, n > 0\}$ is not a regular using Pumping Lemma.

6

6. (a) Define context free grammar.

4

(b) Suppose $L(G) = \{a^m b^n, m > 0 \text{ and } n > 0\}$, find a regular grammar which produces $L(G)$.

4

(c) Prove that a language $L = \{a^n b^n c^n, n \geq 1\}$ is not context free using pumping lemma.

6

UNIT-IV

7. (a) What is a context sensitive language? Explain the properties of a CSL. 1+3=4
(b) Define linear bounded automation. 4
(c) Design a PDA for the language $L = \{a^n b^n, n > 0\}$. 6
8. (a) Define a CSG. Consider a CSG production
 $S \rightarrow abc|aAbc, Ab \rightarrow bA, Ac \rightarrow Bbcc, bB \rightarrow Bb, aB \rightarrow aa|aaA$.
What is the language generated by this grammar? 4+2=6
(b) Define a push down automaton. 4
(c) What is an instantaneous description and turnstile notation? 4

UNIT-V

9. (a) Explain a decidable and undecidable language. 4
(b) Explain the closure properties of a recursive language. 4
(c) Give the formal definition of a Turing machine. 6
10. (a) What is halting problem? 2
(b) Write a note on recursive enumerable languages. 4
(c) Design a Turing machine for the language $L = \{0^n 1^n 2^n\}$ where $n > 0$. 8