

RANI RASHMONI GREEN UNIVERSITY
Post Graduate Department of Computer Science
M.Sc. Semester-I Examinations 2024
Subject: Computer Science
Paper: MSCCS104 (Theory of Computation)

Time: 2 Hours

Full Marks: 40

*The figures in the margin indicate full marks.
Candidates are required to give their answer in their own words as far as practicable.*

Group-A

1. Answer any 5 (five) questions

5X2=10

- i. What is regular expression?
- ii. What is an ambiguous grammar?
- iii. What is recursively enumerable language?
- iv. Write context-free grammar for the language $L(G) = \{a^n b^n : n > 0\}$.
- v. Why is PDA (Push Down Automata) more powerful than FA (Finite Automata)?
- vi. What is the utility of Normal Form?
- vii. State Arden's theorem.

Group B

Answer any 5(five) questions

5X6=30

2. What is CNF (Chomsky Normal Form)? Convert the following Grammar into CNF. 2+4
 $S \rightarrow 1A/0B$
 $A \rightarrow 1AA/0S/0$
 $B \rightarrow 0BB/1$
3. State Pumping Lemma for Regular Language. Show that $L = \{a^n b^n : n > 0\}$ is not regular. 2+4
4. Construct a Pushdown Automata to accept the language $L = \{W_c W^R, \text{ where } W \in (a,b)^+ \text{ and } W^R \text{ is the reverse of } W, c \text{ terminal symbol}\}$. 6
5. Prove that the following grammar is ambiguous.
 $V: \{E\}$
 $\Sigma: \{a, +, *\}$
 $P: E \rightarrow E+E/E*E/a$
 $S: \{E\}$
6. Convert the following grammar into GNF (Greibach Normal Form). 6
 $S \rightarrow AA/a$
 $A \rightarrow SS/b$ {Where A, S Variables and a,b terminal symbols}
7. What is Nondeterministic Finite Automata (NFA)? Draw the DFA of the following: Set of all strings that contains odd number of a's and even number of b's. ($\Sigma = \{a,b\}$).
2+4=6
8. Design a Turing Machine that accept the language $L = \{a^n b^n c^n : n \geq 0\}$ over ($\Sigma = \{a,b,c\}$) 6