

BACHELOR OF TECHNOLOGY (CBCS - 2023)
B. Tech. Sem-III Computer Science & Business Systems : WINTER : 2024
SUBJECT: FORMAL LANGUAGE & AUTOMATA THEORY

Day : Tuesday
 Date : 03/12/2024

W-29213-2024

Time : 10:00 AM-01:00 PM
 Max. Marks : 60

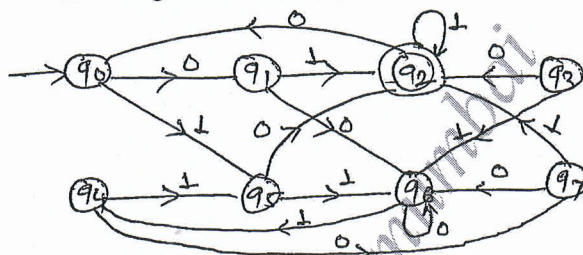
N.B.

- 1) All questions are **COMPULSORY**.
- 2) Figures to the **RIGHT** indicate **FULL** marks.
- 3) Assume suitable data **WHEREVER** necessary.
- 4) Draw neat diagrams **WHEREVER** necessary.

- Q.1** Define the following (10)
- i) Binary Search Tree
 - ii) Complete Bipartite Graph

OR

- Q.1** Minimize the following Deterministic Finite Automata (10)



- Q.2** Design Finite Automata for the following Regular Expression (10)
1. $[10+110^*+1^*0^*1]^*$
 2. $(10^*+110)+(11+101^*)$

OR

- Q.2** Design DFA for set of all strings $\Sigma\{a,b\}$ containing either the substring 'aaa' or 'bbb'. (10)

- Q.3** Discuss Ambiguous Context Free Grammar. Find out the following grammar is ambiguous or not (10)

$S \rightarrow aAS/a$
 $A \rightarrow SbA/SS/ba$

OR

- Q.3** Convert the following right linear grammar to left linear grammar (10)

$S \rightarrow bB$
 $B \rightarrow bC/aB/b$
 $C \rightarrow a$

- Q.4** Design Turing Machine to accept string with equal no. of a's and b's. (10)

OR

- Q.4** Design Turing Machine that recognizes the language $L = 01^*0$ (10)

- Q.5** Design Push Down Automata for $a^nb^{m+n}c^m$ where $m, n \geq 1$. (10)

OR

- Q.5** Design Push Down Automata for accepting the following language (10)
- $L = \{ a^nb^{2n} / n \geq 1 \}$

- Q.6** What does it mean for a problem to be NP complete? Give example of NP complete problem (10)

OR

- Q.6** Explain the Universal Turing Machine in detail (10)
