

**BACHELOR OF TECHNOLOGY (C.B.C.S.) (2021-COURSE)**  
**B. Tech. Sem - III CS&BS : WINTER- 2022**  
**SUBJECT : FORMAL LANGUAGE & AUTOMATA THEORY**

Day : Wednesday  
 Date : 07-12-2022

W-24142-2022

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

**N.B.**

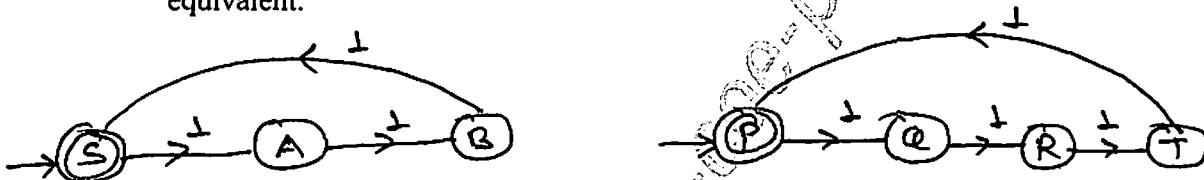
- 1) All questions are **COMPULSORY**.
- 2) Figures to the **RIGHT** indicate **FULL** marks.
- 3) Use of non-programmable calculator is **allowed**.
- 4) Assume suitable data **WHEREVER** necessary.
- 5) Draw neat diagram **WHEREVER** necessary.

- Q.1** Define the following : (10)
- i) Bipartite Graph
  - ii) Complement of Graph.

**OR**

- Q.1** What is tree? Explain spanning tree with example. (10)

- Q.2** Check whether the two finite automata given in the following figure are equivalent. (10)



**OR**

- Q.2** Design NFA and DFA for accepting language of  $\Sigma(a,b)$  both ab and ba as substring. (10)

- Q.3** Construct the finite automata for the regular language represented by the regular expression  $(ab+ac)^*b$ . (10)

**OR**

- Q.3** Convert the following CFG to CNF (10)

$S \rightarrow bA \mid aB$   
 $A \rightarrow bAA \mid aS \mid a$   
 $B \rightarrow aBB \mid bS \mid b$

- Q.4** Design TM that replaces all occurrences of 101 by 010 from sequence of 0's & 1's. (10)

**OR**

- Q.4** Design Turing Machine over  $\Sigma = (a,b)$  to accept the language  $L = \{a^n b^n \mid n > 0\}$  (10)

- Q.5** Prove that post correspondence problem is undecidable. (10)

**OR**

- Q.5** How to use universal Turing Machine? Explain with example. (10)

- Q.6** Write note on NP complete problem with example. (10)

**OR**

- Q.6** Distinguish between deterministic and non-deterministic Turing Machine. (10)