B. TECH. (COMPUTER SCIENCE & BUSINESS SYSTEMS) (CBCS - 2018 COURSE)
B.Tech. (CSBS) Sem - III : : SUMMER - 2022
SUBJECT : FORMAL LANGUAGE & AUTOMATA THEORY

Day : Monday   Time : 02:30 PM-05:30 PM
Date : 30-05-2022   **S-20445-2022**   Max. Marks : 60

N.B.

1) All questions are **COMPULSORY**.
2) Figures to the right indicate **FULL** marks.

Q.1 Let $R = \{(1,2),(2,2),(2,3)\}$ be the relation on set $\{1,2,3\}$. Define R^+ and R^*. **(10)** Also give the Closure Properties of relation.

OR

Design a Finite State Machine for divisibility by 5 tester for decimal numbers.

Q.2 Prove that if M_1 is a Moore machine, them there is a Mealy Machine M_2 **(10)** equivalent.

OR

Construct DFA equivalent to NFA: $M = \left[\{p,q,r,s\},\{0,1\},\delta,\ p,\{q,s\}\right]$ where δ .

Σ / Q	0	1
p	q, r	q
q	r	q, r
r	s	p
s	-	p

Q.3 Find the context free language associated with CFG, G, which is defined as **(10)** follows:

$S \rightarrow aB \mid bA$

$A \rightarrow a \mid aS \mid bAA$

$B \rightarrow b \mid bS \mid aBB$

OR

Convert the following CFG to CNF $S \rightarrow aSa \mid bSb \mid a \mid b \mid aa \mid bb$

Q.4 Explain Multitape Turing Machine. **(10)**

OR

Design a Turing machine to accept the Language $L = \{O^n \mid ^n \mid n \geq 1\}$.

Q.5 Explain Church's Hypothesis. **(10)**

OR

Prove that the Union of two Recursive Language is recursive.

Q.6 Describe the following: **(10)**
 i) Complete problem
 ii) Hamilton circuit problem

OR

Explain the Time and Space complexity of a Turing Machine.

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