BACHELOR OF TECHNOLOGY (C.B.C.S.) (2020 COURSE)
B.Tech.Sem - IV IT :SUMMER- 2022
SUBJECT : FORMAL LANGUAGES & COMPUTATION THEORY

Day : Thursday   Time : 10:00 AM-01:00 PM
Date : 16-06-2022   **S-24719-2022**   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 if necessary.

Q.1 Define Moore and Mealy Machine. Convert following Mealy machine to **(10)** Moore Machine.

Present State	Input = 0		Input = 1	
	State	o/p	State	o/p
q_1	q_1	1	q_2	0
q_2	q_4	1	q_4	1
q_3	q_2	1	q_3	1
q_4	q_3	0	q_1	1

OR

Q.1 Change the given Moore Machine into Mealy Machine.   **(10)**

Present State	0	1	o/p
p	s	p	0
q	q	r	1
r	r	s	0
s	s	p	0

Q.2 Give applications of pumping lemma. Prove that $L = \{a^{n^2} \mid n \geq 1\}$ is regular **(10)** or non-regular.

OR

Q.2 Define regular expression. Convert following regular expression to NFA with **(10)** ε moves $((0+1)*1^+)+0*$.

Q.3 Simplify following grammar using grammar simplification rules.   **(10)**
$S \rightarrow 0A0 \mid 1B1 \mid BB$, $A \rightarrow C$, $B \rightarrow S \mid A$, $C \rightarrow S\varepsilon$

OR

Q.3 Give rules for Chomsky normal form and Greibach normal form. Explain both **(10)** forms with suitable examples.

Q.4 What is CFG? For the grammar given draw parse tree for leftmost and **(10)** rightmost derivation of string 1001.
$S \rightarrow A \mid B$
$A \rightarrow 0A \mid \varepsilon$
$B \rightarrow 0B \mid 1B \mid \varepsilon$

OR

Q.4 Convert the grammar in GNF for given CFG: **(10)**
$E \rightarrow E+T \mid T$, $T \rightarrow T*F \mid F$, $F \rightarrow (E) \mid a$.

Q.5 Design a TM to find the 1's complement of a binary input.   **(10)**

OR

Q.5 Design a TM for recognition of binary string of Type $0^n 1^n$.   **(10)**

Q.6 How time and space complexity is measured explain with example? .   **(10)**

OR

Q.6 When the problem is said to be un-decidable? Briefly explain halting problem. **(10)**

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