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NATIONAL INSTITUTE OF TECHNOLOGY, TIRUCHIRAPPALLI – 620015
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

B.Tech (CSE) - Cycle Test 2 – January – May 2023
CSPC41– Automata and Formal languages

Semester: IV
Curriculum: NITTUGCSE21
Date of Exam: 11th April 2023

Max Marks: 20
Time: 1 hour

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1. Convert the following grammar to Chomsky Normal form where S is the start symbol. (CO2) (4)

   $S \rightarrow AB \mid ABC$
   $A \rightarrow BA \mid BC \mid \varepsilon \mid a$
   $B \rightarrow AC \mid CB \mid \varepsilon \mid b$
   $C \rightarrow BC \mid AB \mid A \mid c$

2. Define a Context free grammar for the following language: (CO2) (2)
   - The set of even length string in $\{0,1\}^*$ with two middle symbols equal
   - The set of strings over $\{a,b\}^*$ such that no string begins with 'abb'

3. If G is a grammar and L(G) contains w. If $|w| = n$, how long is a derivations of w in G if "G is in GNF" and "G is in CNF"? Justify your answer. (CO5) (2)

4. Find a grammar in GNF for the following grammar where E is the start symbol: (CO2) (5)
   $E \rightarrow E+E$
   $E \rightarrow E*E$
   $E \rightarrow (E)$
   $E \rightarrow a$

5. Design a PDA that accepts by final state for the following language. (CO2) (5)
   $\{0^m 1^n \mid m \leq n \leq 2m\}$

6. Using the property of equivalence, convert the designed PDA in Q5 to a PDA accepting by empty stack. (CO2) (2)

--- Best Wishes ---