NATIONAL INSTITUTE OF TECHNOLOGY TIRUCHIRAPPALLI
Semester Exam - Jan. 2021 SESSION

DEPARTMENT	: COMPUTER SCIENCE AND ENGINEERING	
DATE & TIME OF EXAM	: 10/05/2021	10:00 am
SUB CODE & Title	: CSPC41- Formal Languages and Automata Theory	
DURATION	: 2 hour	
FACULTY NAME	: R. LEELA VELUSAMY	Max marks: 30

Note to Student: Answer all the questions. Detailed answer is expected.

1. **Make sure the 'Declaration and statement of authorship' is uploaded along with the answer sheet as cover sheet (First Sheet)**
2. **TIME MANAGEMENT IS YOUR RESPONSIBILITY**

1. a) Construct a DFA for the regular expression ***aa*(*ba*)* | a*bb** and validate a string x with length ≥ 5 using the DFA Constructed. (4)
   b) Design a Moore machine which counts the occurrence of substring bab in a given input string. Explain the working of the Moore machine with a string of length 10. (3)
2. Given the CFG with the set of production rules **{S → AB, S → CA, A → a, B → BC, B → AB, C → aB, C → b}** Find the following:
   a) Determine the generated language and prove it. (2)
   b) Prove or disprove that the CFG is ambiguous. (2)
   c) Construct an equivalent CFG in Greibach normal form. (3)
3. A transition table is given below for a PDA with an initial state q_0 and accepting state q_2. Describe the language accepted by the PDA and validate a string with length ≥ 5. (6)

Move Number	State	Input	Stack Symbol	Move(s)
1	q_0	a	Z_0	(q_0, XZ_0)
2	q_0	b	Z_0	(q_0, XZ_0)
3	q_0	a	X	(q_0, XX)
4	q_0	b	X	(q_0, XX)
5	q_0	c	X	(q_1, X)
6	q_0	c	Z_0	(q_1, Z_0)
7	q_1	a	X	(q_1, Λ)
8	q_1	b	X	(q_1, Λ)
9	q_1	Λ	Z_0	(q_2, Z_0)
	(all other combinations)			none

4. Construct a Turing machine using the **checking of symbols technique** to recognize the language L = {wcy | w and y in {a, b}*, w ≠ y} (6)
5. Use the CYK algorithm to determine whether the strings baba and bbaa are in the language generated by the grammar with production rules {S → C_bA | C_aB, A → C_bD | C_aS | a, B → C_aE | C_bS |a, D → AA, E → BB, C_a → a, C_b → b} (4)

Best Wishes