Code No: R1922055 **R19** SET - 1

II B. Tech II Semester Supplementary Examinations, February – 2022
FORMAL LANGUAGES AND AUTOMATA THEORY
(Computer Science and Engineering)

Time: 3 hours Max. Marks: 75

Answer any **FIVE** Questions each Question from each unit
All Questions carry **Equal** Marks
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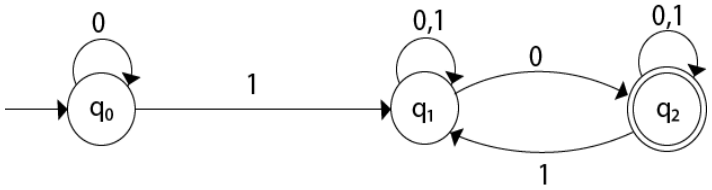
1 a) Define Deterministic and Non-deterministic finite automaton. [8M]

b) Design an NFA with $\sum = \{0, 1\}$ accepts all string in which the third symbol from the right end is always 0. [7M]

Or

2 a) Convert the given NFA to equivalent DFA. [8M]



b) Construct a Moore machine that determines whether an input string contains an even or odd number of 1's. The machine should give 1 as output if an even number of 1's are in the string and 0 otherwise. [7M]

3 a) Prove that the language $L = \{(10)^p 1^q \mid p, q \in N, p \geq q\}$ is not regular. [10M]

b) Describe the closure properties of Regular sets. [5M]

Or

4 a) Design a NFA for the given regular expression 1 (1* 01* 01*)*. [8M]

b) Explain the procedure for converting finite automata to regular grammar with an example. [7M]

5 a) For the grammar G = ({S}, {a, b}, S, P), find out the context free language. [8M]
The productions are given below,
S → abB,
A → aaBb
A → ε
B → bbAa

b) Consider the CFG with {S,A,B) as the non-terminal alphabet, {a,b, ε) as the terminal alphabet, S as the start symbol and the following set of production rules [7M]
S→ASA | aB
A→B|S
B→b|ε
Convert the given grammar into CNF.

Or
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6 a) Consider the CFG with {S,A,B) as the non-terminal alphabet, {a,b) as the terminal alphabet, S as the start symbol and the following set of production rules [8M]
$S \rightarrow ASA \mid aB \mid b$
$A \rightarrow B$
$B \rightarrow b \mid \in$
Find a reduced grammar equivalent to the above grammar.

b) Explain the steps to convert a CFG to GNF with an example. [7M]

7 a) Does push down automata have memory? Justify your answer. [4M]

b) Construct PDA for the given CFG, and test whether 010^4 is acceptable by this PDA. [7M]
$S \rightarrow 0BB$
$B \rightarrow 0S \mid 1S \mid 0$

c) Mention the applications of PDA. [4M]

Or

8 a) Convert the following grammar to a PDA that accepts the same language. [8M]
G = (V, T, R, S) with V = {S}, T = {a, b, c}, and $R = \{S \rightarrow aSa, S \rightarrow bSb, S \rightarrow c\}$.

b) Show that $\{ a^m b^n c^p \mid m < n \text{ or } n < p\}$ is not deterministically context-free. [7M]

9 a) What is the Turing test and why is it important? [4M]

b) Discuss the variants of Turing machines. [4M]

c) What is meant by Reducibility in NP-problems and why it is required? Explain. [7M]

Or

10 a) Construct a Turing Machine for language $L = \{0^n 1^n 2^n \mid n \geq 1\}$. [8M]

b) Show that the Post Correspondence Problem is decidable over unary alphabet. [7M]