II B. Tech II Semester Supplementary Examinations, December - 2023
FORMAL LANGUAGES AND AUTOMATA THEORY
(Common to CSE, CST, CSE(AIML), CSE(AI), CSE(DS), CSE(AIDS), CSE(CS), CSE(IOTCSIBCT), CSE(IOT), AIDS, CS& AIML)

Time: 3 hours   Max. Marks: 70

Answer any **FIVE** Questions each Question from each unit
All Questions carry **Equal** Marks
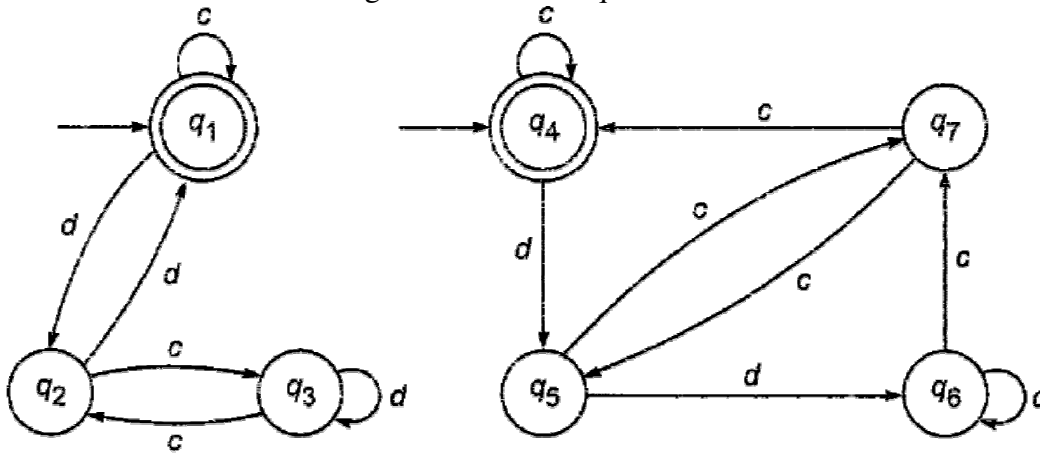~~~~~~~~~~~~~~~~~~~~~~~~~~~
UNIT-I

1   a)   List and explain the components of finite state model with examples.   [7M]

    b)   Obtain a DFA to accept strings of a's and b's such that, each block of 5 consecutive   [7M]
         symbols has at least two a's.

OR

2   a)   Compare and contrast Melay and Moore machines. Give an example for each.   [7M]

    b)   Find whether the two DFAs given below are equivalent or not.   [7M]

UNIT-II

3   a)   Construct a finite automaton for the regular expression $r = 01^* + 10$, also present its   [7M]
         transition table.

    b)   Design a ε-NFA for the regular expression a*b+cb*+ac*b. Then convert it into a   [7M]
         DFA.

OR

4   a)   Discuss about the classification of languages and automata, also present the   [7M]
         relationship between them.

    b)   With suitable examples, explain about the closure properties of regular sets.   [7M]

UNIT-III

5   a)   How to simplify a CFG? Explain with an example.   [7M]

    b)   Show that $L = \{a^n b^n c^n \mid n >= 1\}$ is not context free but context sensitive.   [7M]

OR

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6 a) Convert the below CFG to CNF: [7M]

$$S \rightarrow a \mid aA \mid B$$

$$A \rightarrow aBB \mid \varepsilon$$

$$B \rightarrow Aa \mid b$$

    b) Show that the language $L = \{a^n b^n \mid n \geq 1\}$ is unambiguous.   [7M]

UNIT-IV

7 a) With an example, explain the structure and working of tow-stack PDA.   [7M]

    b) Construct a deterministic PDA accepting $L = \{w \in \{a, b\} * \mid$ the number of a's in w   [7M] equals the number of b's in w} by final state.

OR

8 a) With is an Instantaneous Description? Give the general model and graphical   [7M] representation of a PDA.

    b) Convert the following grammar to PDA that accepts the same language by empty   [7M] stack S→ 0AA, A→0S/1S/0.

UNIT-V

9 a) Define the terms: [7M]
       (i) Turing Semi-Decidable (ii) Turing Undecidable   (iii) Reducibility

    b) Design a Turing machine to recognize the language $\{1^n 2^n 3^n \mid n \geq 1\}$.   [7M]

OR

10 a) List and briefly explain different variants in Turing Machines.   [7M]

     b) What are the circumstances under $P = NP$ and $P \neq NP$?   [7M]

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