Hall Ticket No | | | | | | | | | | |

Question Paper Code:AITC04

INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)
Dundigal-500043, Hyderabad

B.Tech IV SEMESTER END EXAMINATIONS (REGULAR) - JULY 2022
Regulation:UG20

THEORY OF COMPUTATION

Time: 3 Hours **(CSE | CSE(AI&ML) | CSIT | IT)** **Max Marks: 70**

Answer ALL questions in Module I and II
Answer ONE out of two questions in Modules III, IV and V
(NOTE: Provision is given to answer TWO questions from among one of the Modules III / IV / V
All Questions Carry Equal Marks
All parts of the question must be answered in one place only

MODULE – I

1. (a) Differentiate the following:
i) Deterministic finite automata(FA) and non-deterministic finite automata
ii) Mealy machine and Moore machine [BL: Understand| CO: 1|Marks: 7]

(b) Design a DFA to accepts strings over $\sum = \{a, b\}$ such that strings should start with 'aa' but not end with 'aa'(show transition graph, transition table, transition functions)
[BL: Apply| CO: 1|Marks: 7]

MODULE – II

2. (a) Summarize the closure properties of the regular languages and describe each with an example.
[BL:Understand | CO: 2|Marks: 7]

(b) Write a regular expression for the following languages, over $\sum = \{a, b\}$.
i) Seventh symbol from the right must be a.
ii) Every second character is b.
iii) Exactly one ab.
iv) Starting with a and ending with b [BL: Apply| CO: 2|Marks: 7]

MODULE – III

3. (a) Illustrate the construction of Greibach normal form and ambiguity concept in CFG with an example.
[BL: Understand| CO: 3|Marks: 7]

(b) Prove that $L = \{a^n b^n c^n | n \geq 1\}$ is not a context free language. [BL: Apply| CO: 3|Marks: 7]

4. (a) What is unit production? Explain the steps to simplify a context free grammar with example.
[BL: Understand| CO: 4|Marks: 7]

(b) Give a context-free grammar generating the language
i) L = the complement of the language $\{a^n b^n | n \geq 0\}$.
ii) Strings generating palindrome over $\{a, b\}$. [BL: Apply| CO: 4|Marks: 7]

MODULE – IV

5. (a) List the conditions for a pushdown automaton to be considered as deterministic. Differentiate between non-deterministic PDA and deterministic PDA. [BL: Understand| CO: 5|Marks: 7]

   (b) Design push down automata for given CFL:
   L = $\{0^n1^m2^m3^n|m,n \geq 0\}$ [BL: Apply| CO: 5|Marks: 7]

6. (a) Can we construct a deterministic PDA for the language ww^R? Justify your answer. Otherwise how can we modify this language to make it accepted by DPDA. [BL: Understand| CO: 5|Marks: 7]

   (b) Construct PDA for the given CFG, and test whether 010000 is acceptable by this PDA.
   i) S → 0BB
   ii) B → 0S | 1S | 0 [BL: Apply| CO: 5|Marks: 7]

MODULE – V

7. (a) Explain the following:
   i) Turing machine as a language acceptor and transducer
   ii) Halting problem of Turing machine. [BL: Understand| CO: 6|Marks: 7]

   (b) Construct transition diagram for turing machine that accepts the language L = $\{0^n1^m|m,n \geq 1\}$. Give the transition diagram for the turing machine obtained and also show the moves made by the turing machine for the string 0011 and 001. [BL: Apply| CO: 6|Marks: 7]

8. (a) Outline Chomsky hierarchy of languages. Prepare a table indicating the automata and grammars for the languages in the Chomsky hierarchy. [BL: Understand| CO: 6|Marks: 7]

   (b) Design a total turing machine to accept the language: $L = \{w\epsilon\{a,b,c\}^*|\#a(w)+ \leq b(w) \leq \#c(w)\}$
   (Note: '#' means number) [BL: Apply| CO: 6|Marks: 7]

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