Hall Ticket No | | | | | | | | | | | Question Paper Code: AITC04

INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Dundigal-500043, Hyderabad

B.Tech IV SEMESTER END EXAMINATIONS (REGULAR / SUPPLEMENTARY) - AUGUST 2023

Regulation: UG-20

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
All Questions Carry Equal Marks
All parts of the question must be answered in one place only

MODULE – I

1. (a) Describe how various rules used for construction of ϵ-NFA with suitable example and also write th steps for NFA with ϵ to NFA conversion with an example. [BL: Understand| CO: 1|Marks: 7]

   (b) Differentiate DFA and NFA with an example. Give DFA's accepting the following languages over the alphabet {0, 1}.
   i) The set of all strings ending in 00.
   ii) The set of all strings with three consecutive 0's. (not necessarily at the end).
   [BL: Apply| CO: 1|Marks: 7]

MODULE – II

2. (a) Illustrate the steps for conversion of regular grammar to finite automata? Construct the FA for the following grammar
   S→ aS/bA/b ,A→aA/bS/a [BL: Understand| CO: 2|Marks: 7]

   (b) Convert the following NFA given in Figure 1 into a RE using the state elimination method.
   [BL: Apply| CO: 2|Marks: 7]

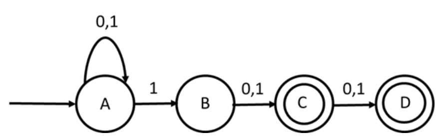

Figure 1

MODULE – III

3. (a) Enlist any three closure properties of regular languages with an illustration.
   [BL: Understand| CO: 3|Marks: 7]

   (b) Prove that the given languages are not regular using the pumping lemma.
   i) $L = \{w = a^J b^K : J = K\}$
   ii) $L = \{w = a^J b^K : J > K\}$ [BL: Apply| CO: 3|Marks: 7]

4. (a) Summarize about ambiguous Grammar. Check whether the grammar:
   S→aAB, A→bC/cd, C→cd, B→c/d is ambiguous or not? [BL: Understand| CO: 4|Marks: 7]

(b) Convert the CFG into CNF
S →AB | Aa
A →aaA | a
B→bbB | b [BL: Apply| CO: 4|Marks: 7]

MODULE – IV

5. (a) Differentiate push down automata (PDA) and DPDA with an example. Show that for every PDA there exists a CFG such that $L(G) = N(P)$. [BL: Understand| CO: 5|Marks: 7]

   (b) Construct a PDA that accepts the language $L = \{a^n b^m c^m d^n | m, n \geq 1\}$ by using an empty stack. [BL: Apply| CO: 5|Marks: 7]

6. (a) Outline the followings:
   i) Closure properties of context free languages.
   ii) Deterministic context free languages
   iii) Deterministic Pushdown Automata. [BL: Understand| CO: 5|Marks: 7]

   (b) Convert the grammar CFG to a PDA
   E→E+E
   E→id [BL: Apply| CO: 5|Marks: 7]

MODULE – V

7. (a) Give an overview of recursively enumerable language. Mention the properties of recursive and non-recursive enumerable languages. [BL: Understand| CO: 6|Marks: 7]

   (b) Construct a Turing machine that will accept the language consists of all palindromes of 0's and 1's? [BL: Apply| CO: 6|Marks: 7]

8. (a) Describe in detail about different types of Turing machines Compare and contrast the finite state machine, PDA and Turing machine. [BL: Understand| CO: 6|Marks: 7]

   (b) Build Turing machine M, 1011 , where
   M = $(q_1, q_2, q_3, 0, 1, 0, 1, B, \delta, q_1, B, q_2)$ has moves,
   $\delta(q_1, 1) = (q_3, 0, R)$
   $\delta(q_3, 0) = (q_1, 1, R)$
   $\delta(q_3, 1) = (q_2, 0, R)$
   $\delta(q_3, B) = (q_3, 1, L)$ [BL: Apply| CO: 6|Marks: 7]

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