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

INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)
(Dundigal-500043, Hyderabad)

B.Tech V SEMESTER END EXAMINATIONS (REGULAR) - DECEMBER 2022
Regulation:UG20
THEORY OF COMPUTATION

Time: 3 Hours **(Common to CS | DS)** **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) What is DFA? Draw a DFA to accept strings of 0's and 1's that either begins or ends or both with the strings 01. [BL: Understand| CO: 1|Marks: 7]

   (b) Consider the following ε-NFA given in Table 1 [BL: Apply| CO: 1|Marks: 7]

Table 1

δ	ε	a	b	c
→p	Φ	{p}	{q}	{r}
q	{p}	{q}	{r}	Φ
*r	{q}	{r}	Φ	{p}

i) Show ε-closure of each state.
ii) Convert the automata to DFA.

MODULE – II

2. (a) Show that the family of regular languages are closed under, union, concatenation and star closure. [BL: Understand| CO: 2|Marks: 7]

   (b) Give the formal definition of a regular expression. Develop a regular expression for the following language:
   i) L={w: na(w) mod 3=0 where wϵ {a,b}*}
   ii) L={anbm : n≥4, m≥3}
   iii) Strings of a's and b's containing not more than three a's. [BL: Apply| CO: 2|Marks: 7]

MODULE – III

3. (a) List different types of normal forms. Illustrate the construction of Greibach normal form with an example. [BL: Understand| CO: 3|Marks: 7]

(b) Write about LMD and RMD. Consider the grammar with productions
S→ AB | ε
A→ aB
B→ Sb
For the string aabbbb show i) Leftmost derivation ii) Rightmost derivation iii) Derivation tree.
[BL: Apply| CO: 3|Marks: 7]

4. (a) Summarize about ambiguous grammar with example. Describe the procedure to eliminate ϵ productions in grammar. [BL: Understand| CO: 4|Marks: 7]

(b) Apply the standard procedures to eliminate ε-productions, unit productions and useless symbols for the following grammar
S→ a | aA | B | C | D | E
A→ aB | ε
B→ Aa
C→ eCD
D→ dE
E→ eE | D
[BL: Apply| CO: 4|Marks: 7]

MODULE – IV

5. (a) Outline the concept of PDA. Differentiate between deterministic and non deterministic PDA.
[BL: Understand| CO: 5|Marks: 7]

(b) Design the PDA by constructing state diagram and transition functions to accept the language L=$\{wcw^R$:w$\epsilon\{\{$a,b$\}^*\}$ by the empty stack. [BL: Apply| CO: 5|Marks: 7]

6. (a) Discuss about deterministic context free languages and deterministic push down automata.
[BL: Understand| CO: 5|Marks: 7]

(b) Develop a CFG for the following PDA
$\delta(q_0$,a,z)= (q_0, AZ), $\delta(q_0$,a,A)= (q_0, A), $\delta(q_0$,b,A)= (q_1, ε), $\delta(q_0,\varepsilon$,z)= (q_2, ε)
[BL: Apply| CO: 5|Marks: 7]

MODULE – V

7. (a) Describe a turing machine. With a neat diagram, explain its working.
[BL: Understand| CO: 6|Marks: 7]

(b) Construct a transition diagram for turing machine to accept the language L=$\{$w =$\neq w^R|$ wϵ(a+b)$*\}$
[BL: Apply| CO: 6|Marks: 7]

8. (a) Summarize the following terms in detail:
i) Church's Hypothesis
ii) Counter machine [BL: Understand| CO: 6|Marks: 7]

(b) Construct transition diagram for turing machine that accepts the language L=$\{0^n1^n|n\geq 1\}$. Give the transition diagram for the turing machine obtained and also show the moves made by the turing machine for the string 000111. [BL: Apply| CO: 6|Marks: 7]

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