



DHARMSINH DESAI UNIVERSITY, NADIAD
FACULTY OF TECHNOLOGY
B.TECH. SEMESTER VI [COMPUTER ENGINEERING]
SUBJECT: (CE-623) THEORY OF AUTOMATA AND FORMAL LANGUAGES

Examination : Third Sessional

Seat No. : 103

Date : 19 / 03 / 2025

Day : Wednesday

Time : 2:30 PM to 3:45 PM

Max. Marks : 36

INSTRUCTIONS:

1. Figures to the right indicate maximum marks for that question.
2. The symbols used carry their usual meanings.
3. Assume suitable data, if required & mention them clearly.
4. Draw neat sketches wherever necessary.

Q.1 Do as directed. [12]

CO4 U (a) \wedge - Transitions are not defined in Turing Machines. Is it the limitation of TM or due to some other reason? Justify your answer. [2]

CO4 U (b) Is there any language, which can't be accepted by any Turing Machine? Justify your answer. [2]

CO4 R (c) State and briefly discuss "Church-Turing" Thesis. [2]

CO3 A (d) Eliminate the left recursion from the following grammar: [3]
 $S \rightarrow Aa \mid b, A \rightarrow Ac \mid Sd \mid \epsilon$

CO3 A (e) Convert the RE into FA. $RE = (a(a+b)^*a) + (b(a+b)^*b) + a + b + \epsilon$ [3]

Q.2 Attempt Any TWO from the following questions. [12]

CO4 A (a) Construct a Turing Machine for accepting the below language: [6]
 $L = \{scs \mid s \in \{a, b\}^*\}$

CO4 A (b) Draw the Insert (σ) TM, which changes the tape contents from $y\bar{z}$ to $y\sigma z$. [6]
Here, $y \in (\Sigma \cup \{\Delta\})^*$, $\sigma \in \Sigma \cup \{\Delta\}$ and $z \in \Sigma^*$. Assume that $\Sigma = \{a, b\}$.

CO4 U (c) Discuss the encoding of a Turing Machine in Universal Turing Machine, with a suitable example. [6]

Q.3 Attempt the following question. [12]

CO4 A (a) Construct a PDA for the language $L = \{uawb \mid u, w \in \{a, b\}^*, |u| = |w|\}$ [6]

CO4 A (b) Consider the below given grammar and perform Bottom-Up parsing by generating shift-reduce table for the string " $a^*a^*a^*a$ ". [6]

OR

Q.3 Attempt the following questions. [12]

CO4 A (a) Construct a PDA for the following language [6]
 $L = \{a^i b^j c^k \mid i = j \text{ or } j = k, \text{ and } i, j, k \geq 1\}$

CO4 A (b) Create NPDA, which accepts the language generated by following grammar: [6]

$S \rightarrow aAB, A \rightarrow aBA \mid bAA \mid a, B \rightarrow aBB \mid bAB \mid b$

$S \rightarrow S + T$

$S \rightarrow T$

$T \rightarrow T * a$

$T \rightarrow a$