

JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -2 EXAMINATION- 2025

B.Tech-III Semester (CSE)

COURSE CODE (CREDITS): 25B11CI315 (3)

MAX. MARKS: 25

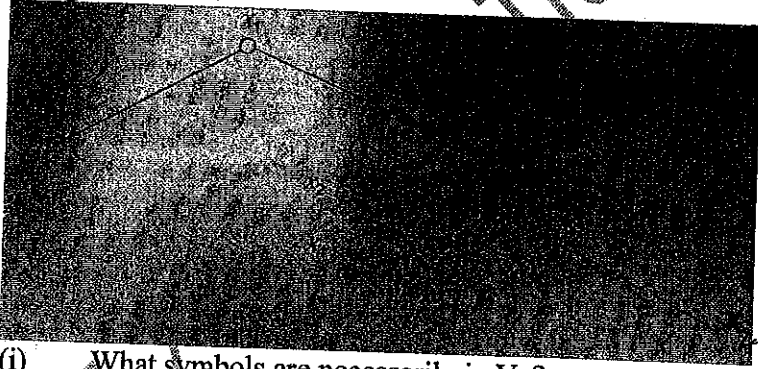
COURSE NAME: Theory of Computation

COURSE INSTRUCTORS: ARV*, MNK, NSA, RMS, SKS, SMA

MAX. TIME: 1 Hour 30 Min

Note: (a) All questions are compulsory.

(b) The candidate is allowed to make Suitable numeric assumptions wherever required for solving problems

Q.No	Question	CO	Marks
Q1	Consider the language $L = \{wcw^R \mid w \in \{a,b\}^*\}$, where w^R is the reverse of string w . (a) Classify this language in the Chomsky Hierarchy and specify why it belongs to that specific type of Chomsky Hierarchy. (b) Construct a respective grammar that generates L .	3	5
Q2	A derivation tree of a sentential form of a grammar G is given in the following figure:  (i) What symbols are necessarily in V_N ? (ii) What symbols are likely to be in Σ ? Determine if the following strings are sentential forms: (a) X_4X_2 , (b) $X_2X_2X_3X_2X_3X_2$	3	5
Q3	(a) Construct a CFG for the language: $\{a^i b^j c^k \mid i \neq j \text{ or } j \neq k\}$ (b) Convert the above constructed CFG in Greibach Normal Form (GNF).	3	5
Q4	Eliminate Unit Productions from the following grammar: $S \rightarrow a \mid Xb \mid aYa \mid b \mid aa$ $X \rightarrow Y$ $Y \rightarrow b \mid X$	3	5
Q5	Consider the following Context free grammar. $S \rightarrow aAa \mid aBC$ $A \rightarrow aS \mid bD$ $B \rightarrow aBa \mid b$ $C \rightarrow abb \mid DD$ $D \rightarrow aDa$ a. Construct the reduced grammar from this Context free grammar. b. Convert the reduced grammar after eliminating the useless symbols into Chomsky Normal Form (CNF).	3	5