

S.E. INFT SEM III NEP June 2026

(Time: 2 Hours)

[Marks: 60]

11/06/26.

N.B.: 1) All Question carry equal Marks.

2) Question no. 1 is Compulsory.

3) Solve Three of the remaining Five questions.

4) Figures to the right indicate full marks.

- Q.1) Answer the following questions (ANY 3)
- (a) State the definition of Mealy and Moore machine along with its tuples. [05]
 - (b) Describe Chomsky Hierarchy. [05]
 - (c) Discuss the halting problem of Turing Machine. [05]
 - (d) Differentiate between Finite State Machine (FSM) and Push Down Automata (PDA). [05]
- Q.2) (a) Design a Deterministic Finite Automata (DFA) over the $\Sigma = \{a, b\}$ for [10]
- (a) $(ab)^n$ with $n \geq 0$
 - (b) $(ab)^n$ with $n \geq 1$
- (b) Write a note on Non-Deterministic Finite Automata (NFA). [05]
- Q.3) (a) Convert the following grammar into Chomsky Normal Form (CNF) [07]
- $$S \rightarrow aAbB$$
- $$S \rightarrow aA/a$$
- $$S \rightarrow bB/b$$
- (b) Construct the parse trees for the given strings using specified derivation format for [08]
- given grammar G where $G = (\{S, A, B\}, \{a, b\}, P, \{S\})$
- $$P = S \rightarrow aB, \quad S \rightarrow bA,$$
- $$A \rightarrow a, \quad A \rightarrow aS,$$
- $$A \rightarrow bAA, \quad B \rightarrow b,$$
- $$B \rightarrow bS, \quad B \rightarrow aBB$$
- Strings:
- (a) aaabbb (rightmost derivation)
 - (b) aababb (leftmost derivation)
- Q.4) (a) Design a PDA for the language $L = \{a^n b^{2n} / n \geq 1\}$ [10]
- (b) What is ambiguous grammar? Explain with an example. [05]
- Q.5) (a) Describe the language denoted by the following regular expressions where $L \subseteq \{a, b\}^*$ [05]
- (a) $(a + b)^* b$
 - (b) $(b^* a b^* a b^* a b^*)^*$
 - (c) $(a + b)^* b a$
 - (d) $b^* a^*$
 - (e) $(a + b)^* a b + a^*$
- (b) Design a TM for the language $L = \{a^n b^n / n \geq 1\}$ [10]
- Q.6) Write short notes on (Any Three): [15]
- (a) Phases of a Compiler
 - (b) Variants of TM.
 - (c) Minimization of DFA.
 - (d) Regular Expressions and Regular Grammar
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