

Note:- 1) Question No. 1 is Compulsory.

2) Solve any three out of remaining question.

Q.1 Answer any four. (20)

a) Differentiate between Moore machine and Mealy machine.

b) What do you mean by ambiguous grammar? Prove that the following grammar is ambiguous.

$$S \rightarrow aS / aSbS / \epsilon$$

c) Distinguish between NFA and DFA.

d) What is Halting problem? Explain with example.

e) What is a regular expression? Design DFA corresponding to the regular expression

$$(0+1)^* 101(0+1)^+$$

Q.2 a) Define the structure of Push Down Automata (PDA). Explain the power and limitations of PDA. (10)

b) Design PDA to accept language $L = \{a^n b^{2n} \mid n \geq 1\}$. (10)

Q.3 a) Define CFG. Design a CFG for the language $L = \{0^n 1^{2n} \mid n \geq 0\}$. (10)

b) Find the leftmost derivation, rightmost derivation and parse trees for the string aaabbabbba using CFG: (10)

$$S \rightarrow aB / bA$$

$$A \rightarrow aS / bAA / a$$

$$B \rightarrow bS / aBB / b$$

Q.4 a) Describe Chomsky Normal Form (CNF). Convert the following CFG to CNF (10)

$$S \rightarrow aAbB$$

$$A \rightarrow Ab / b$$

$$B \rightarrow Ba / a$$

b) Explain Greibach Normal Form (GNF) Convert the following CFG to GNF (10)

$$S \rightarrow XY$$

$$X \rightarrow 0X / 1Y / 1$$

$$Y \rightarrow 1$$

Q.5 a) What is a Turing Machine (TM)? Explain the working of TM with a neat sketch.

Also describe the variants of TM (10)

b) Design a TM to accept $(a^n b^n c^n)$. Can a DFA be designed for the same? Justify. (10)

Q.6 Write short notes on (any four) (20)

a) Application of FA, CFG, PDA and TM

b) Chomsky Hierarchy

c) Right Linear and Left Linear Grammars

d) Phases of Compiler

e) Reduced DFA

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