Q.1 (5x4=20)
(a) State halting problem of Turing machine and prove that Halting problem is undecidable.
(b) Differentiate between deterministic and non-deterministic Turing machine.
(c) What is transformation based tagging? Explain with suitable example.
(d) What is lexical semantics?

SECTION A

2(a) Explain Chomsky classification of grammars with examples. (10)
(b) Construct a grammar in GNF equivalent to grammar
   \[ S \rightarrow AAa \]
   \[ A \rightarrow SSb \]
   (10)

3. Design Turing machine for given language \( 1^n \ 2^n \ 3^n \) where \( n \geq 1 \). Also explain the steps in detail. (20)

4(a) What do you mean by primitive recursive and partial recursive function? (10)
(b) Write short notes on Church Turing hypothesis (10)

SECTION B

5(a) What do you mean by regular expression? Explain Range, Grouping, Disjunction and Anchors with suitable example. (10)
(b) Write algorithm for DFSA. (10)

6(a) What is parser. Explain its types and requirement. (10)
(b) Define following terms (10)
   i. Context-Free rules and trees
   ii. Stochastic part-of-speech tagging

7. Write short notes on following terms (5x4)
   i. First order predicate calculus
   ii. Relational among lexemes and their senses
   iii. Idioms and compositionality
   iv. Syntax-Driven semantic analysis