

Duration : 3 hours

Total marks : 80

- N.B.: (1) Question No. 1 is Compulsory  
 (2) Attempt any three questions out of remaining five questions  
 (3) Assume suitable data wherever required but justify that  
 (4) Assumptions should be clearly stated.
- 1 a Differentiate between DFA and NFA. [5]  
 b Show that  $L = \{0^n 1^n \mid n > 0\}$  is not regular using pumping lemma. [5]  
 c Define FA. List down the applications of FA. [5]  
 d Explain Recursively Enumerable Language. [5]
- 2 a Construct the NFA with  $\epsilon$ -moves for the regular expression [10]  
 a) for the language which ends in either 01 or 101 over  $\Sigma = \{0,1\}$   
 b) for the R.E  $(a^*b^*(ab)^*)$  over  $\Sigma = \{a,b\}$   
 b Construct the DFA that accepts the language represented by  $0^*1^*2^*$ . [10]
- 3 a Convert the given grammar into Griebach Normal Form [10]  
 $S \rightarrow ABA \mid AB \mid BA \mid AA \mid A \mid B$   
 $A \rightarrow aA \mid a$   
 $B \rightarrow bB \mid b$   
 b Design Mealy Machine for the language represented as  $(0+1)^*(00+11)$  [10]
- 4 a State and prove pumping lemma for context free languages. [10]  
 b Write Short note on [10]  
 i) Post Correspondence problem  
 ii) Chomsky Heirarchy
- 5 a Design PDA that accepts the language  $L = \{a^n b^m a^n \mid m, n \geq 1\}$  [10]  
 b Design turing machine to accept languages over  $\Sigma = \{0,1\}$  where  $L = \{0^n 1^n \mid n \geq 0\}$  [10]
- 6 a Draw a parse tree for the string aabbba for the CFG given by G where [10]  
 $P = \{S \rightarrow aAS \mid a$   
 $A \rightarrow SbA \mid SS \mid ba$   
 Perform both leftmost and rightmost derivation.  
 b Briefly Explain the types of Turing Machine. [10]

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