

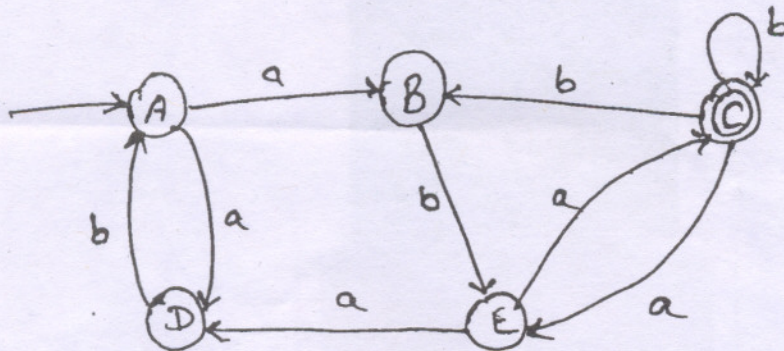
N.B. (1) Question No. 1 is compulsory.

(2) Attempt any four questions from Question Nos. 2 to 7.

(3) Figures to the right indicate full marks given to the questions.

(4) Assume suitable data if necessary.

1. (a) How FSM is different from NFA and DFA ? 3  
 (b) What is NP-Hard problem ? Explain. 5  
 (c) Design a Turing machine for multiplication of two integer. 12
  
2. (a) Construct NDPDA for the language  $L = \{ 0^n 1^{2n} \mid n \geq 0 \}$ . Such that  $L = L(M)$ . 10  
 (b) Find a MSFA recognizing the language corresponding to each of these regular expression.  
     (i).  $(0^* 10 + 1^* 0) (01)^*$  5  
     (ii)  $(0 + 1)^* 00 (10)^+$  5
  
3. (a) Show that the grammar with production :  
     (i)  $S \rightarrow aSb \mid SS \mid \epsilon$  5  
     (ii)  $S \rightarrow aSbS \mid bSaS \mid \epsilon$  is ambiguous. 5  
 (b) Convert the following into equivalent CNF [Chomsky Normal Form] :— 10  
      $S \rightarrow 11S100$   
      $S \rightarrow 00S111$   
      $S \rightarrow 00 \mid \epsilon$
  
4. (a) Convert following NFA to DFA :— 10



- (b) Design a Moore and Mealy machine to get 2's complement of number. 10
  
5. (a) Explain the types of grammar with suitable example. 10  
 (b) What is pumping lemma ? Prove : 10  
     (i)  $L \{ a^n b^n c^n \mid n > 0 \}$  is not context free  
     (ii)  $L = \{ a^n \mid n \text{ is prime} \}$  is not regular.
  
6. (a) Eliminate useless symbols, Useless Production, Unit production and Null production from the following grammar 10  
      $S \rightarrow aS \mid A \mid C$   
      $A \rightarrow a$   
      $B \rightarrow aa$   
      $C \rightarrow aCb \mid C$   
 (b) Generate and reduce the grammar for the following to CNF and GNF. 10  
      $L = \{ a^n b^n \mid n \geq 1 \}$ .
  
7. Write short notes on any four : 20  
     (a) Post correspondence problem (d) Universal turing machine  
     (b) Power of PDA (e) Ambiguous Grammar.  
     (c) Parsing Technique