

THEORY OF COMPUTATION  
Paper-PC-CS-AIDS-301A

Time : Three Hours]

[Maximum Marks : 75

**Note :** Attempt five questions in all, selecting at least one question from each unit. Each question carry equal marks.

## UNIT-I

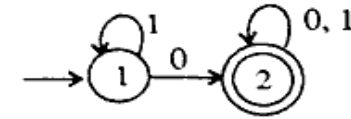
1. (a) If  $L$  is accepted by an NFA with  $\epsilon$ -transition then show that  $L$  is accepted by an NFA without  $\epsilon$ -transition.
- (b) Construct a DFA equivalent to the NFA.  $M = (\{p, q, r\}, \{0, 1\}, \delta, p, \{q, s\})$ . Where  $\delta$  is defined in the following table.

$\delta$	0	1
$p$	{q,s}	{q}
$q$	{r}	{q,r}
$r$	{s}	{p}
$s$	-	{q}

(7+8=15)

2. (a) Write short notes on precedence of Regular expression operators. Construct an NFA equivalent to the regular expression  $(0+1)^*(00+11)(0+1)^*$ .

- (b) Write about equivalence and minimization of NFA and DFA automata. Obtain the regular expression that denotes the language accepted by the following DFA.



(7+8=15)

## UNIT-II

3. (a) Let  $G$  be the grammar  $S \rightarrow aB/bA$ ,  $A \rightarrow a/aS/bAA$ ,  $B \rightarrow b/bS/aBB$ . Obtain parse tree for the string  $aaabbabbba$ .
- (b) Discuss closure properties of CFL.
- (c) Convert the grammar  $S \rightarrow AB$ ,  $A \rightarrow BS/b$ ,  $B \rightarrow SA/a$  into Greibach Normal Form. (5+5+5=15)
4. (a) Discuss Pumping lemma along with its advantages. State Pumping Lemma for Context free languages.
- (b) Define a Regular set using pumping lemma. Show that the language  $L = \{0i^2 \mid i \text{ is an integer } i \geq 1\}$  is not regular. (7+8=15)

## UNIT- III

5. Write a detailed note on the representation, equivalence and designing of Mealey and Moore machines. (15)
6. What are the different ways in which a PDA accepts the language? Define them. Is it true that non-deterministic PDA is more powerful than that of deterministic PDA? Justify your answer and explore the potential applications of PDA. (15)

#### UNIT- IV

7. (a) What is Turing machine? Explain in detail : "The Turing Machine as a Computer of integer functions".  
(b) Explain time and tape complexity measures of Turing machines. (7+8=15)
8. (a) When a problem is said to be decidable or undecidable? Give an example of decidable and an undecidable.  
(b) What is Post's Correspondence problem (PCP)? Discuss. (7+8=15)
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