

GUJARAT TECHNOLOGICAL UNIVERSITY
BE – SEMESTER – VI (OLD).EXAMINATION – WINTER 2016

Subject Code: 160704

Date: 26/10/2016

Subject Name: Theory of Computation

Time: 10:30 AM to 01:00 PM

Total Marks: 70

Instructions:

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

- Q.1** (a) Define Mathematical Induction principle and prove that for any $n \geq 4$, $n! > 2^n$ **07**
(b) Explain following **07**
i. One to one and onto function
ii. Properties of equivalence relation.
- Q.2** (a) Draw FA for each of the following RE. **07**
i. $(0+1)^*(1+00)(0+1)^*$
ii. $(0+1)^*(01+110)$
iii. $(111+100)^*0$
(b) Suppose that language L1 and L2 are the subsets given below. **07**
L1 = {x | 00 is not a substring of x} L2 = {x | x ends with 01}
Draw FA for intersection L1 and L2
OR
- (b) For each of the RE draw NFA- Λ **07**
i. $(0+1)^*(011+01010)(0+1)^*$ ii. $(0+1)(01)^*(011)^*$
- Q.3** (a) Explain pumping lemma and its application. **07**
(b) For the following CFG, Find Chomsky normal form **07**
 $S \rightarrow AACD$ $A \rightarrow aAb | \Lambda$ $C \rightarrow aC | a$ $D \rightarrow aDa | bDb | \Lambda$
OR
- Q.3** (a) Find regular expression for following **07**
i. Language of all strings containing exactly two 0's.
ii. Language of all strings that begins or ends with 00 or 11.
iii. Language of all strings in which every 0 is followed immediately by 11.
(b) For the following CFG, Find Chomsky normal form **07**
 $S \rightarrow AaA | CA | BbB$ $A \rightarrow aaBa | CDA | aa | DC$ $B \rightarrow bB | bAB | bb | aS$
 $C \rightarrow Ca | bC | D$ $D \rightarrow bD | \Lambda$
- Q.4** (a) Write PDA for language of palindrome. Trace it with example. **07**
(b) Explain Universal Turing Machine. **07**
OR
- Q.4** (a) Write PDA for the string with equal number of a's and b's. Trace it with example. **07**
(b) Draw a TM to accept { ss | s $\in$ {a,b}* }. **07**
- Q.5** (a) Draw a TM to copy strings. **07**
(b) Find minimum state FA recognizing the language corresponding to following RE. **07**
i. $(0^*10+1^*0)(01)^*$ ii. $(010)^*1 + (1^*0)^*$
OR
- Q.5** (a) Explain Primitive recursive Function. **07**
(b) Explain P, NP and NP complete problem. **07**
