Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VI • EXAMINATION – SUMMER 2013

Subject Code: 160704 Date: 03-06-2013

Subject Name: Theory of Computation

Time: 10.30 am - 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)** Answer the following **07**

1. In the given relation determine the properties(reflexivity, symmetry, transitivity), which ones the relation has: R = {(1,1),(2,2),(3,3),(1,2)} and R = Ø

2. Show that for any language L, $L^* = (L^*)^* = (L^+)^* = (L^*)^+$

3. Give the definition of ñTransitive Closure of a Relationò using induction.

(b) Answer the following **07**

1. Define regular language and regular expressions.

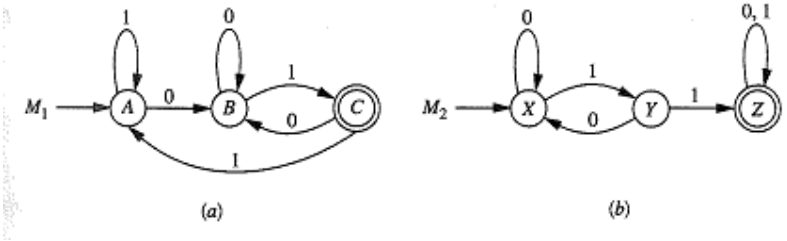
2. Find regular expression for the following:
Language of all string that do not end with 01.

3. Describe the language corresponding to following: (1+01)*(0+01)*

Q.2 **(a)** Answer the following **07**

1.Draw FA for regular expression: (111+100)*0

2. Let M1 and M2 be the FA in fig below for the language L1 and L2, find L1 U L2 and L1 ž L2.



(b) Answer the following **07**

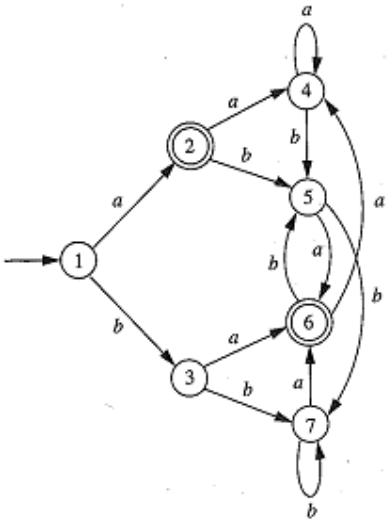
1.Write theorem: For any NFA M =(Q,Ɛ,q_0,A,ŭ) accepting a language L, there is an FA M1 =(Q,Ɛ,q_1,A_1,ŭ$_1$) that also accepts L.

OR

(b) Write Kleneeôs Theorem part-I, Any regular language can be accepted by a finite automation. **07**

Q.3 **(a)** Answer the following **07**

1. For following NFA find minimum FA accepting same language 5



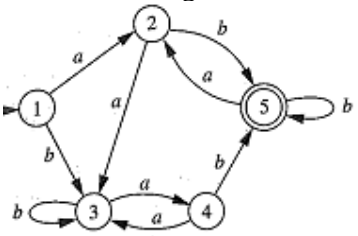
2. Use the pumping lemma to show that following language is not regular: L = {ww|w Ɛ{0,1}*} 2

(b) Write theorem: If L1 and L2 are context free languages, then the language L1 U L2, L1L2 and L1* are also CFLs. **07**

OR

Q.3 **(a)** Answer the following **07**

1. For following NFA find minimum FA accepting same language 5



2. Use the pumping lemma to show that following language is not regular: L = {xy|x,y Ɛ{0,1}* and y is either x or x^r} 2

(b) Answer the following **07**

1.Find context free grammar generating following language
$\{a^i b^j c^k \mid i = j \text{ or } i = k\}$

2. Show that CFG S → a|Sa|bSS|SSb|SbS is ambiguous.

3. find an equivalent unambiguous grammar for following:
S →A|B A → aAb|ab B → abB|ε

Q.4 **(a)** Explain bottom up parsing with example. **07**

(b) Write TM accepting Palindrome. **07**

OR

Q.4 **(a)** Write transition table for PDA recognizing following language: **07**
$\{a^i b^j c^k \mid j = i \text{ or } j = k\}$.

Q.4 **(b)** Write TM accepting {ss | s Ɛ{a,b}*} **07**

Q.5 **(a)** Explain the following **07**

1. Basic Complexity Classes.
2. P and NP Completeness.

(b) Explain the following **07**

1. Primitive Recursive Operation & Function.
2. ε Recursive Functions.

OR

Q.5 **(a)** Explain the following **07**

1. Time and space complexity.
2. NP complete problem.

(b) Write theorem: Let f: $Ɛ^*_1 \rightarrow Ɛ^*_2$. Then f is computable if and only if f is ε recursive. **07**

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