Student Exam No._____

GANPAT UNIVERSITY

B. Tech. Semester VI Computer Engineering/Information Technology

Regular Examination May-June 2013

2CE601/2IT601: Theory of Computation

Time: 3 Hours **Total Marks:** 70

Instructions:
1. All questions are compulsory
2. Figures to the right indicate full marks.
3. Answer Both Sections in Separate Answer sheets

SECTION – I

Q-1 **[A]** Give recursive definition of each of followings. **[4]**
1. The set N of all natural numbers.
2. The language of strings of palindromes.

[B] In each case, say whether the statement is a tautology, a contradiction or neither. Give supporting proof. **[4]**
1. $Q \wedge (P \rightarrow Q)$
2. $(P \rightarrow Q) \wedge (\neg P \rightarrow Q)$

[C] Prove using mathematical induction that for every n>=1 **[4]**

$\sum i*2^i = (n-1)*2^{n+1} + 2$

OR

Q-1 **[A]** Write recursive definition of language of strings with more a's than b's. Prove that REV (x y) = REV (y) REV (x) for two string x, y of some alphabet. **[6]**

[B] State whether following statements are true or false. Also give reason. **[4]**
1. if 1+1=3, then 1+2=3
2. 2+4=3 only if 2+2=4

[C] Show that the statements P v Q v R v S and $(\sim P \wedge \sim Q \wedge \sim R) \rightarrow S$ are equivalent. **[2]**

Q-2 **[A]** Find the regular expression for FA in following Fig. A and B. **[6]**

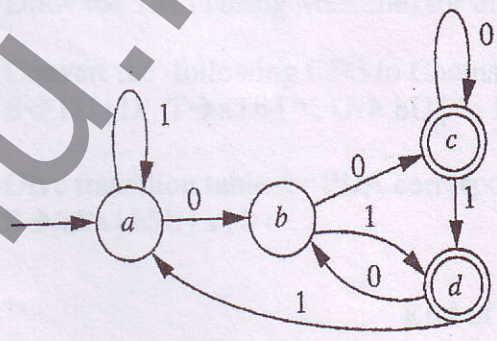


Fig. A.

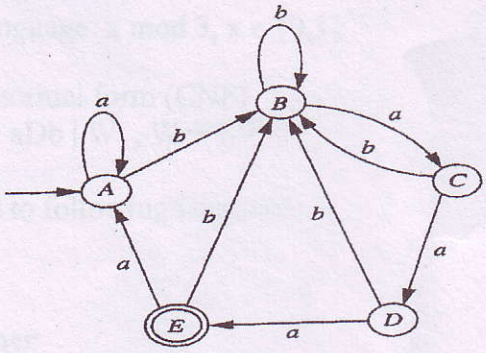


Fig. B.

[B] Convert following NFA given in Fig. B to DFA using subset construction. [5]

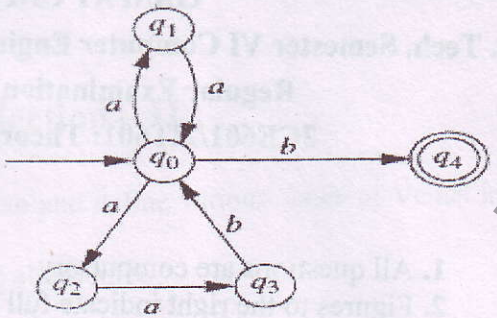


Fig. B.

OR

Q-2 [A] In each case, find a string of minimum length in {0,1}* not in the language corresponding to the given regular expression. [6]

1. 1* (01)* 0*
2. (0* + 1*) (0* + 1*) (0* + 1*)
3. 0* (100*) 1*

[B] Draw DFA corresponds to following regular expressions [5]

1. (11 + 10)*
2. (0+1) (0+1) (0+1)

Q-3 [A] Draw NFA-null using KLEEN's theorem part-I for (0+1)* 0* (10 + 01)* [6]

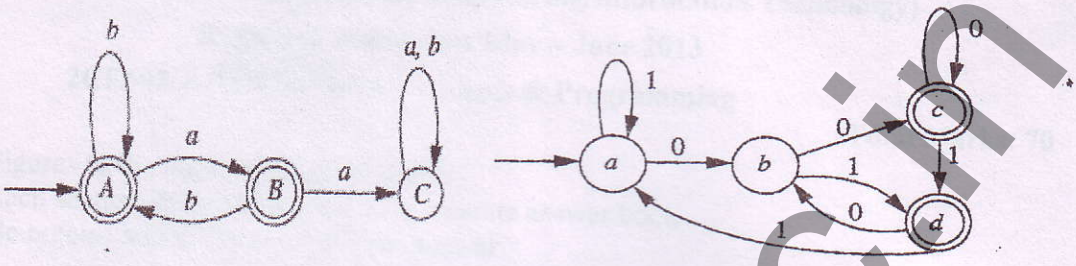
[B] Let M=(Q,∑,q_0 , A ,δ) be an NFA - null, where Q={q_0,q_1,q_2 ,q_3}, ∑={0,1}, A={q_3} and δ is given by the following table. [6]

q	δ(q,0)	δ(q,1)	δ(q,^)
q_0	{q_0, q_1}	{q_0}	{q_1}
q_1	{q_2}	{q_1}	{q_0, q_2}
q_2	{q_3}	{q_3}	{q_3}
q_3	Ø	Ø	{q_1}

find δ*(q_0,11) , δ*(q_0, 001)

SECTION – II

Q-4 **[A]** Derive regular CFG for the following FA. **[6]**



[B] Using pumping lemma for regular language prove that language $L = \{0^i 1^i \mid i >= 0\}$ is not a regular language. **[6]**

OR

Q-4 **[A]** Give a grammar which has "Dangling Else" problem. Also draw the derivation tree. **[6]**

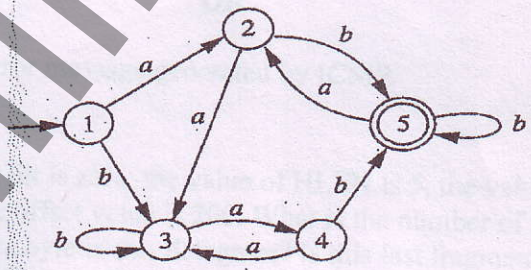
[B] Show, using the pumping lemma for CFL that the given language L is not a CFL. Where, $L = \{a^n b^{2n} a^n / n>=0\}$ **[6]**

Q-5 **[A]** Draw a TM (Turing Machine) accepting language of palindrome strings. **[6]**

[B] Consider the language of all balanced strings involving two types of brackets [] {}. CFG with productions are : **[5]**
S -> SS | [S] | {S} | Λ
Give transition table for **Deterministic** PDA accepting the above language.

OR

Q-5 **[A]** For the following FA find a minimum state FA recognizing the same language. **[6]**



[B] Draw the TM (Turing Machine) for the language x mod 3, $x \in \{0,1\}^*$ **[5]**

Q-6 **[A]** Convert the following CFG to Chomsky normal form (CNF) **[6]**
S→TU | D , T→aTb | ^ , U→ bU | ^ , D→ aDb | W , W→ bW | ^

[B] Give transition table for PDA corresponds to following language **[6]**
S→ aSa | bSb | a | b |^

End of Paper