2012

[This question paper contains 5 printed pages.]

6628 *Your Roll No.....*

B.Sc. (H) Computer Science / VI Sem. B

Paper 601 : Theory of Computation

(Admissions of 2001 and onwards)

Time : 3 Hours *Maximum Marks : 75*

(Write your Roll No. on the top immediately on receipt of this question paper.)

Question No. **1** *is compulsory. Attempt any* **four** *from the rest. Assume* $\Sigma = \{a, b\}$ *for all the questions unless specified otherwise. Parts of a question must be answered together.*

1. (a) What is a recursive language ? Illustrate with the help of an example. (4)

   (b) Write a regular expression for the set of all words that end in double letter. (3)

   (c) Give a grammar for the language of odd palindromes. (3)

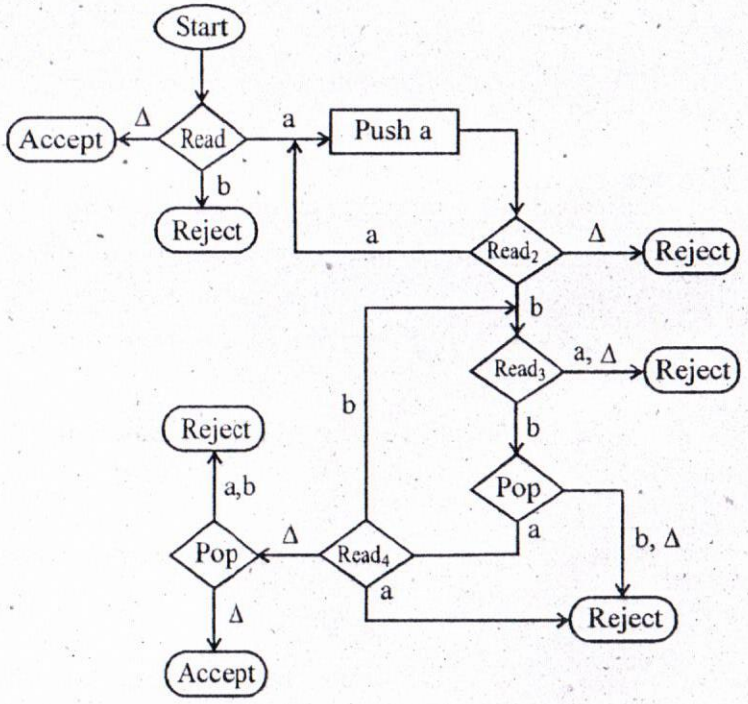
   (d) Give FA that accepts all words with different first and last letters. (5)

P.T.O.

(e) Prove the language $a^nb^na^n$ for n = 1 2 3 ... is non context–free. (5)

(f) Show that the CFG S->aS | Sa | a is ambiguous. (4)

(g) What is the language accepted by the following PDA ? Find a CFG that generates this language. (4)



(h) State Kleene's Theorem. (2)

(i) Design a Turing machine that computes the function f(m) = m+2, where m is a positive binary number. (5)

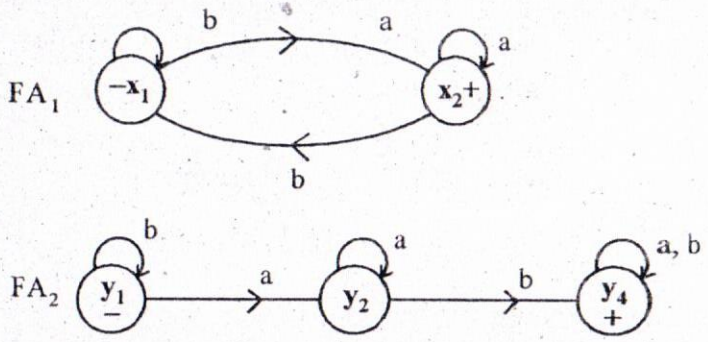
2. (a) Show that $(a + b)^* = (a + b)^*ab\,(a+b)^* + b^*a^*$. (3)

(b) Give regular expression for the language L where $L = \{a^nb^m \mid m \geq 0,\ n \geq 3\}$. (2)

(c) If S = {a, b} and $T^* = S^*$. Prove that T must contain S. (3)

(d) Describe the language associated with the regular expression $(a(aa)^*b(bb)^*)^*$. (2)

3. (a) Construct FA for language FA_1FA_2 where FA_1 and FA_2 are given below : (4)



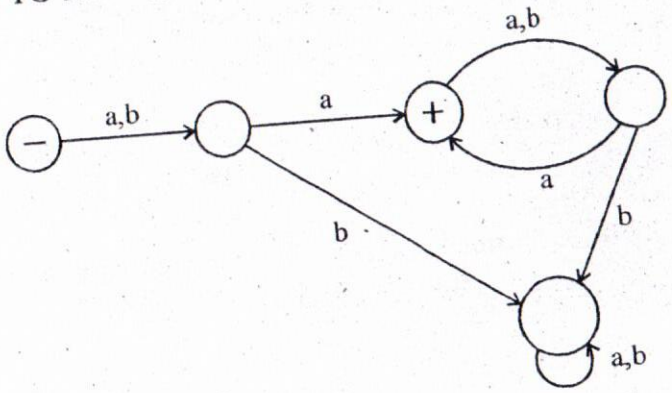
(b) Construct Fas for the language L_1 and L_2 as given below.

$L_1 = (a + b)\ b(a + b)^*,\ L_2 = b(a + b)^*$

Find a regular expression and FA's that define $L_1 \cap L_2$. (6)

P.T.O.

4. (a) Using the bypass algorithm, convert the following TG into regular expression. (5)



(b) Write a CFG for the language over the alphabet = {a, b} consisting of all words with no three consecutive b's. (5)

5. (a) Draw a PDA for the language

$\{a^n b^n a^m$, where n,m = 1,2,3,...$\}$ (5)

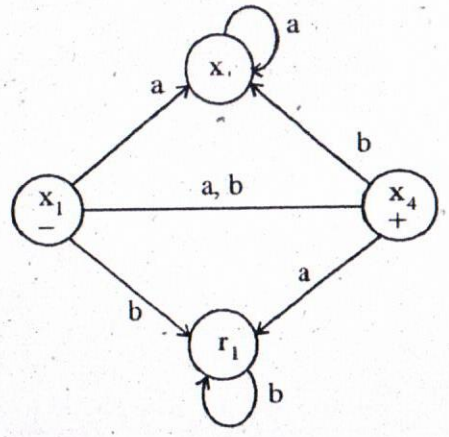
(b) Show that the language

$\{a^m b^n$ where $m = 2n+1, n \geq 1\}$ is not regular. (5)

6. (a) Design a copying machine C which transform UwU into UwUw where w contain no blanks. (5)

(b) Describe Universal Turing Machine with the help of suitable notations. (5)

7. (a) Convert the following NFA into DFA (5)



(b) Are Context free languages closed under Intersection ? Explain with example. (5)