9/m/B

B.E / B. Tech (Full Time) DEGREE END SEMESTER EXAMINATION, NOV / DEC 2013

INFORMATION TECHNOLOGY,

FOURTH SEMESTER – (REGULATIONS 2008)

IT9251 – FORMAL LANGUAGES AND AUTOMATA

Time: 3 Hrs. Max Marks :100

Answer ALL Questions

Part- A (10 * 2 = 20 Mark)

1. Define proof by mathematical induction
2. Explain the term Language?
3. List the closure properties of regular sets
4. Give the recursive definition for regular expression.
5. Define ambiguous grammar and give example
6. Find a Greibach normal-form grammar equivalent to the following CFG.

   S -> AA| a
   A ->SS | b
7. State the pumping lemma for Context free languages
8. Name the languages accepted by TM.
9. Write the differences between the top-down and bottom-up parsing.
10. List the properties of TM

Part- B (5 * 16 = 80 Mark)

11) (a) Design a DFA (deterministic finite automaton) to accept the language (16)

0* 1 (0*10*1)*0*

12) (a) i) Find the regular expression for the following DFA Figure 1 (10)

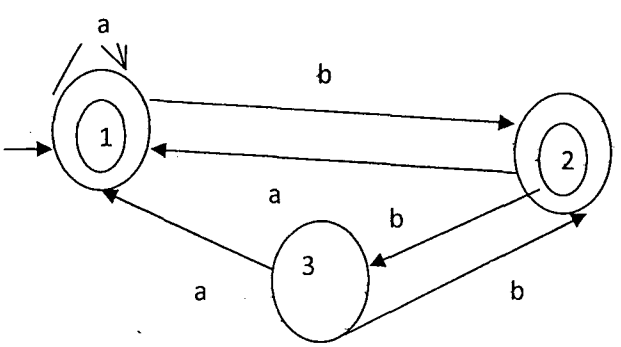

Figure 1

ii) Prove that the following is not regular languages. $\{0^i 1^i / i>=0\}$ (6)

(OR)

12) (b) i) Explain the algorithm used to minimize the automata. Construct a minimum automaton equivalent to an automaton Figure 2. (16)

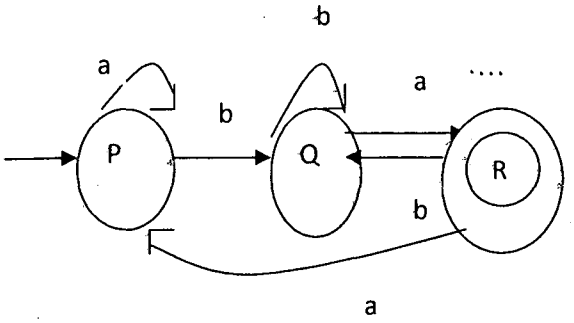

Figure 2

13) (a) i) Prove that the CFG G1 with productions is unambiguous (8)

G1: S1 -> S1 + T / T
T -> T * F / F
F -> (S1) / a

ii) Find the equivalent unambiguous grammar for the following grammar productions (8)

S -> ABA

A -> aA / Δ

B -> bB / Δ

(OR)

13) (b) i) Construct PDA for the language L = $\{ x \in \{a , b\}^* / n_a(x) > n_b(x) \}$ and write the ID for the string **abaabbaba** (16)

14) (a) i) Prove that a CFG is in Chomsky Normal Form (CNF) if every production is of one of these two types

A-> BC

A-> a

where *A, B* and *C* are variables and *a* is a terminal symbol (8)

ii) Convert the following grammar G with productions to Chomsky Normal Form (8)

S-> AACA

A-> aAb / Δ

C -> aC / a

D-> aDa / bDa / Δ

(OR)

14) (b) i)Draw the transition diagram for a turing machine (TM) accepting the language $L = \{ a^i b^j / i < j\}$ and trace it for the acceptance of the following strings i) aabb ii) aaabb (8)

ii) Draw a TM that compute the function f(x) = 2x and trace it to compute the following strings i) 11 1111 ii) 11 111 (8)

15) (a) i) Define LL(1) parsing and compute First and Follow Sets for the given grammars (16)

a)
$S \rightarrow ABc$
$A \rightarrow a$
$A \rightarrow \lambda$
$B \rightarrow b$
$B \rightarrow \lambda$

b)
$S \rightarrow aSe$
$S \rightarrow B$
$B \rightarrow bBe$
$B \rightarrow C$
$C \rightarrow cCe$
$C \rightarrow d$

(OR)

(b) i) Write the design procedure of shift reduce passer by taking a suitable example. (16)