Code No: 114AG

R13

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B.Tech II Year II Semester Examinations, October/November - 2016
FORMAL LANGUAGES AND AUTOMATA THEORY
(Computer Science and Engineering)

Time: 3 Hours **Max. Marks: 75**

Note: This question paper contains two parts A and B.
Part A is compulsory which carries 25 marks. Answer all questions in Part A.
Part B consists of 5 Units. Answer any one full question from each unit.
Each question carries 10 marks and may have a, b, c as sub questions.

PART - A **(25 Marks)**

1.a) Define δ in NFA with ε (Epsilon) moves. [2]
b) Design FA to accept set of all strings over {0,1} containing 4 consecutive zeros. [3]
c) Define Right Linear Grammar. [2]
d) Define Regular Expression. [3]
e) Define Ambiguous Grammar. [2]
f) When will you say that Grammar is Left Recursive? How to eliminate Left recursion? [3]
g) Define Context sensitive Grammar. [2]
h) Define Linear Bounded Automaton. [3]
i) Give any two examples of Decidable Problems. [2]
j) Give any three examples of recursive languages. [3]

PART - B **(50 Marks)**

2.a) Convert the following NFA with € moves to DFA.(Figure 1)

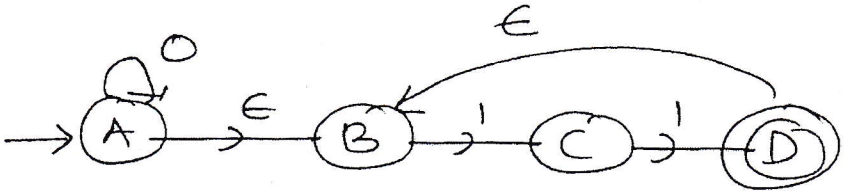

Figure 1

b) Minimize the following DFA. (Figure 2) [5+5]

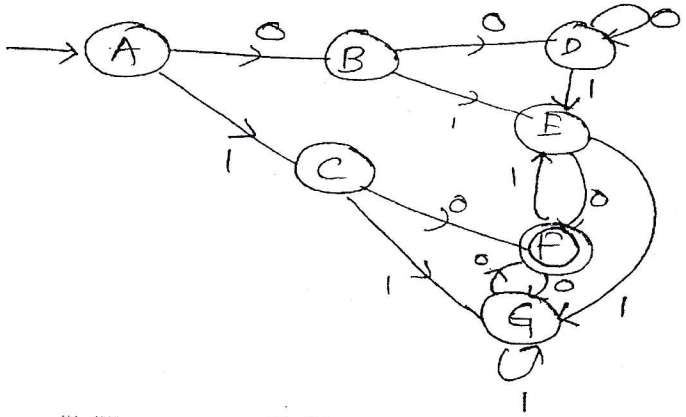

Figure 2

OR

3.a) Let $L_1 = \{010\}$, $L_2=\{01,0\}$ then find
(i) L_1L_2 (ii)L_1^* (iii)L_2^+ (iv) $L_1^* + L_2^*$

b) Verify the following two FA's are equivalent or not? (Figure 3 and Figure 4) [6+4]

FA1:

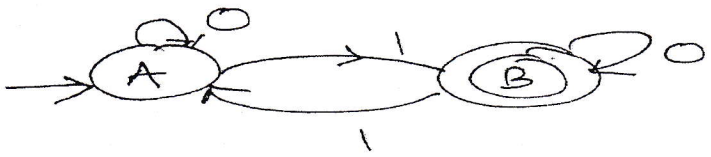

Figure 3

FA2:

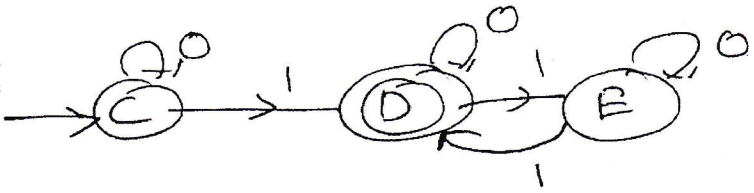

Figure 4

4.a) Construct Finite Automata for the regular expression $\mathbf{0^*1^*(101)^*11}$.

b) Obtain the finite automata for the grammar G=({A,B},{0,1},P,A) Where **P** is given as **A-> 0A | 1B | 1, B-> 0B | 0 .** [5+5]

OR

5.a) Write about closure properties of regular sets.

b) Convert the following Finite Automata to it's equivalent Regular Expression. (Figure 5) [5+5]

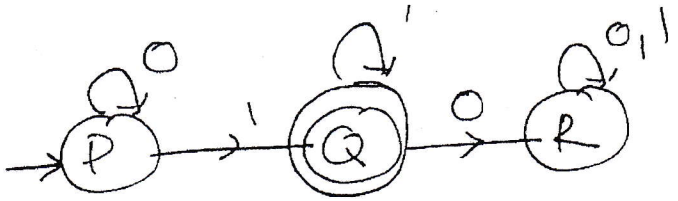

Figure 5

6.a) Construct CFG for the PDA given below **A=({q0,q1},{0,1},{S,A},δ,q0,S,φ)** where δ is given as below

δ (q0,1,S)={(q0,AS)}
δ (q0,ε,S)={(q0,ε)}
δ (q0,1,A)={(q0,AA)}
δ (q0,0,A)={(q1,A)}
δ (q0,1,A)={(q1,ε)}
δ (q1,0,S)={(q0,S)}

b) Construct PDA for the language **L={ a^nb^n / n>=1}** [5+5]

OR

7.a) Construct PDA for the language **L={WW^r /where W Є(a+b)*, W^r is reverse of W}.**

b) Construct PDA for the given CFG: **S→aSb, S→ab,** Where **S** is the only variable and **{a,b}** are terminals. [5+5]