MCA-304: Automata Theory
Master of Computer Applications
Semester Third, Nov/Dec-2017

Time: Three Hours **Max. Marks:70**

Q1 a) What is ambiguity of CFG? Show that the given grammar is ambiguous **(7 marks)**

S->SbS
S->a

b) Consider the given grammar
E->E*T|T
T->F-T|F
F->(E)|0|1
Write the leftmost and rightmost derivation and draw the parse tree.

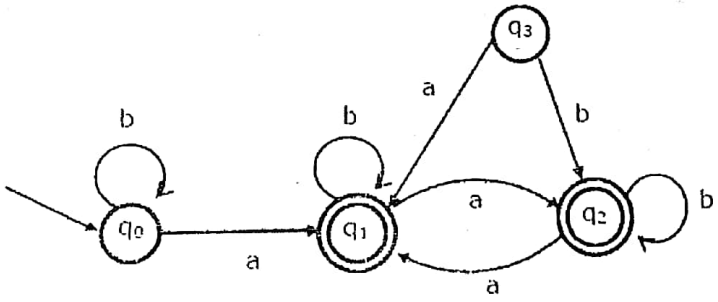
Q2 Define PDA formally. Design a PDA for language L and write the grammar corresponding to it, where $L=\{a^i b^j c^k: i=j \text{ or } j=k\}$ **(7 marks)**

Q3 Design a Turing machine to accept language L over Σ=(a,b), where L ={w| w contains equal number of a's and b's}.

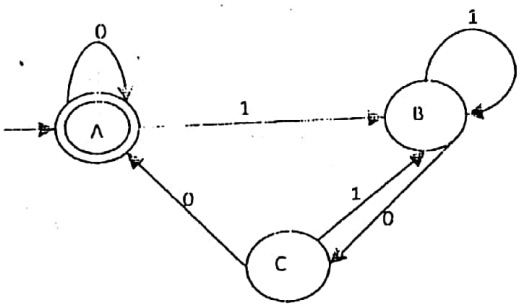
(7 marks)

Q4 Define symbol and alphabet in automata theory. What is a regular expression? Write the regular expression for the language accepted by the given Finite State Automaton **(7 marks)**

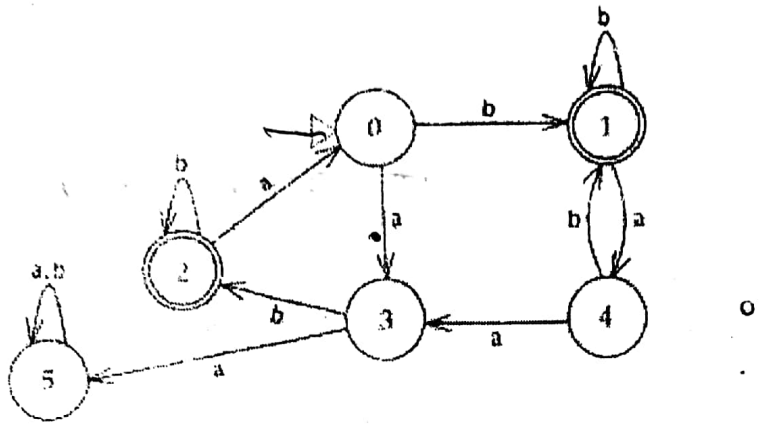
a)



b)



Q5 What is a dead state? Determine the dead state in the ~~given~~ DFA. Minimize the given DFA given below **(7 marks)**



Q6 Differentiate between Mealy and Moore machine. Design a Mealy machine for a full binary adder. **(5 marks)**

Q7 What is halting problem. Prove that halting problem is undecidable. **(5 marks)**

Q8 Determine the type of language L, where $L=\{wxw^R \mid x,w \in \{a,b\}^+\}$. Design the corresponding automaton which accepts L. **(5 marks)**

Q9 Design CFG for the given languages **(5 marks)**

a) L=(w|w contains equal number of a's and b's}

b) $L=\{a^n ww^R b^n \mid w \in \{0,1\}^*$ and $n>1, |w|0 \geq\}$

Q10 What is CNF? Convert the given grammar below into CNF. **(5 marks)**

S→AB|AC
A→aA|bAa|a
B→bbA|aB|AB
C→aCa|aD
D→aD|bC

Q11 Differentiate between multitape and multitrack turing machine. Simulate multitape turing machine on single tape. **(5 marks)**

Q12 Draw the Finite state automata for the guven regular expressions **(5 marks)**

1) (00+11)*00(0+1)*
2) 01(0111)*11

----------END----------