Reg. No. : | | | | | | | | | | | | |

Question Paper Code : 11144

B.E./B.Tech. DEGREE EXAMINATION, MAY/JUNE 2014.

Fifth Semester

Computer Science and Engineering

080230020 – FORMAL LANGUAGES AND AUTOMATA THEORY

(Regulation 2008)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — ($10 \times 2 = 20$ marks)

1. Write the three main steps involved to prove induction hypothesis.

2. Write the condition to prove two automata are equivalent.

3. What is meant by non regular grammar? Give example.

4. Write regular expression for language over the input symbols $\Sigma = \{a,b\}$, in which the strings of the language should not have two consecutive a and b as substring.

5. What is meant by emptiness and finiteness of the language?

6. Prove that the given language is not regular. $L = \{a^n b^n \mid$ where $n >= 1)$

7. Write CFG for the language $L = \{a^n b^{2n} \mid$ where $n >= 1\}$

8. Write the equivalent unambiguous grammar for the following grammar :
   $E \rightarrow E + E \mid E * E \mid (E) \mid id$

9. Convert the given CFG into CNF.
   $S \rightarrow aS \mid bS \mid AB \mid \in$
   $A \rightarrow dA \mid \in$
   $B \rightarrow b$

10. Eliminate left recursion of the given grammar:
    $A \rightarrow AaB \mid a \mid aB$
    $B \rightarrow b$

PART B — (5 × 16 = 80 marks)

11. (a) (i) Prove that "For every NFA, there exists a DFA which simulates the behavior of NFA If L is the set accepted by NFA, then there exists a DFA which also accepts L". (10)

(ii) Write the applications of automata (6)

Or

(b) (i) Prove that "If L is accepted by NFA with ε - transitions then L is accepted by an NFA without ε -transitions". (8)

(ii) Construct NFA-$\in$ for the regular expression (a | b)* and convert it into DFA. (8)

12. (a) Write an algorithm for generating regular expression from DFA. (16)

Or

(b) (i) Prove that all context free grammars are not regular grammar. (6)

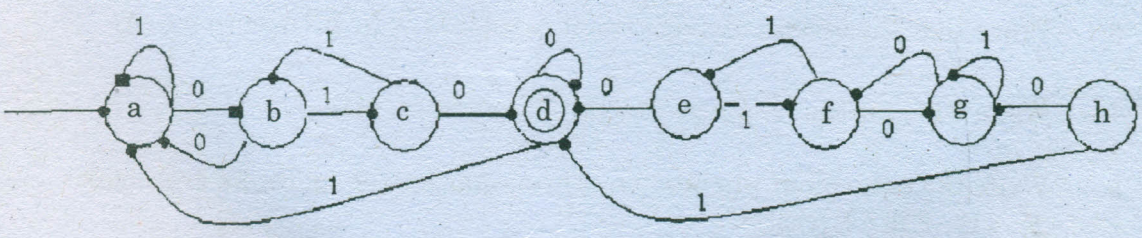
(ii) Write the applications of regular expression. (6)

(iii) Write the characteristic of language for which regular expression can not be written. (4)

13. (a) Prove that regular languages are closed under union, concatenation and closure. (16)

Or

(b) (i) Construct minimum state finite automata for the following DFA. (10)



(ii) State and prove pumping lemma for Regular Language. (6)

14. (a) (i) Prove that the equivalence of PDA and CFG. (10)

(ii) Write the applications of CFG. (6)

Or

(b) (i) Construct PDA for language of Palindrome over input symbol $\Sigma = \{a, b\}$. (10)

(ii) Prove that the following grammar is not ambiguous. (6)

$S \rightarrow S + A \mid A$

$A \rightarrow A * B \mid B$

$B \rightarrow (S) \mid id$

15. (a) Convert the following grammar into GNF (16)

$A \rightarrow BC$

$B \rightarrow CA \mid b$

$C \rightarrow AB \mid a$

Or

(b) (i) Prove that CFL's are not closed under complementation. (8)

(ii) State and prove the pumping lemma for CFL. (8)
