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Reg. No. : .....

Name : .....

Sixth Semester B.Tech. Degree Examination, April 2014
(2008 Scheme)
Branch : COMPUTER SCIENCE AND ENGG.
08.603 : Formal Languages and Automata Theory

Time: 3 Hours Max. Marks: 100

PART – A

(Answer **all** questions)

1. State Myhill-Nerode's theorem. What is the significance of it in automata design ?
2. Write three differences in DFA/NFA, pushdown automata and Turing machines.
3. State pumping lemma for regular languages.
4. Explain the use of finite automata and regular expression.
5. Differentiate between NPDA and DPDA with an example.
6. Find the language that is generated by the grammar.

   $S \rightarrow 0A/1S/0/1$

   $A \rightarrow 1A/1S/1.$
7. Define context-sensitive language. Why is it called context sensitive language ?
8. What is undecidability problem ?
9. "Given a Turing machine, T, Is L (T) regular or context-free or recursive or none" ? What category of problem is this ?
10. Differentiate between deterministic and non-deterministic Turing machines.

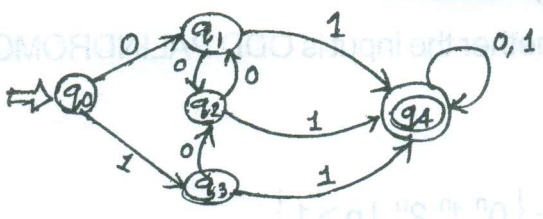
(10×4=40 Marks)

PART – B

Module – I

11. a) Prove that the language $L = \{ a^p \mid p \text{ is a prime} \}$
    i) is not a regular language
    ii) is not a context free language. **10**

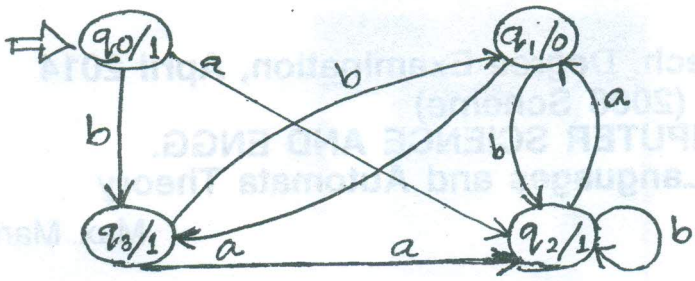
    b) Minimize the states in the following DFA.



10

OR

12. a) What is Moore machine ? Change the given Moore machine to Mealy machine.



10

b) Prove that for every regular expression, there is an equivalent NFA with ϵ-transitions. 10

Module – II

13. a) Prove that the context-free languages are closed under union, concatenation and kleene closure. 8

b) Define Greibach Normal Form (GNF). Reduce the following grammar into GNF.

$S \rightarrow AB, A \rightarrow BS/b, B \rightarrow SA/a.$ 12

OR

14. a) Find the grammars that generate the following languages :

i) $L = \{a^n x b^n \mid n \geq 0, x \in \{a, b\}^*, \mid x \mid = n\}$

ii) $L = \{a^n b^{n+1} \mid n \geq 0\}$. 12

b) Explain the following :

i) ϵ-production
ii) Unit production
iii) Useless symbol
iv) Null productions. 8

Module – III

15. a) Explain the working of universal Turing machines. 10

b) Design a Turing machine which finds whether the input is ODD PALINDROMO. Input is defined over {a, b}. 10

OR

16. Design a Turing machine for language $L = \{0^n 1^n 2^n \mid n \geq 1\}$. 20