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Reg. No. : .....

Name : .....

Sixth Semester B.Tech. Degree Examination, May 2016
(2008 Scheme)
08.603 : FORMAL LANGUAGES AND AUTOMATA THEORY (R)

Time : 3 Hours Max. Marks : 100

PART – A

Answer **all** questions : **(10×4=40 Marks)**

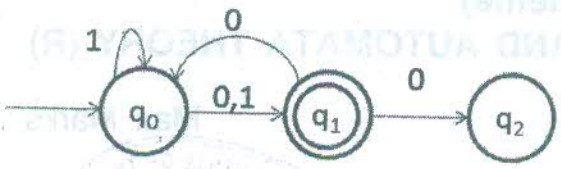
1. Construct a DFA that accepts all strings with at least one a and exactly two b's on $\sum = \{a,b\}$.
2. Compare Moore and Mealy machines with suitable examples.
3. With the help of suitable example, prove that regular sets are closed under union and intersection.
4. Give regular expression for the following languages on $\sum = \{a,b\}$
   1) All strings containing no more than three a's.
   2) All strings in which all runs of a's have lengths that are multiples of three.
5. Define right most derivation and left most derivation with examples for each.
6. Define ambiguous and inherently ambiguous grammar with example.
7. Explain in detail the relationship of language families using Chomsky hierarchy.
8. Define Greibach Normal Form. Convert the grammar $S \rightarrow aSb/ab$ into Greibach Normal Form.
9. Define multitape Turing machine and compare with single tape Turing machine.
10. Differentiate between tractable and intractable problems.

P.T.O.

PART – B

Module – I

11. Construct an equivalent DFA for the NFA given below. 10



12. State pumping lemma for regular languages. Show that $L = \{a^{n!} : n \geq 1\}$ on $\sum = \{a\}$ is not regular. 10

OR

13. Explain in detail with an example the conversion of NFA to DFA. 10

14. State pumping lemma for regular languages. Show that $L = \{w : n_a(w) \neq n_b(w)\}$ on $\sum = \{a\}$ is not regular. 10

Module – II

15. Define pushdown automata Design a PDA which accepts $L = \{a^n b^{2n} : n \geq 1\}$ 10

16. Remove all unit-productions, all useless productions and all λ productions from the grammar. 10

$S \rightarrow aA/aBB,$

$A \rightarrow aaA/\lambda,$

$B \rightarrow bB/bbC$

$C \rightarrow B$

OR

17. Design a pushdown automata which accepts $L = \{a^n b^n : n \geq 1\}$. 10

18. Define Chomsky Normal Form. Transform the following grammar into Chomsky normal form. 10

$S \rightarrow ABa$,

$A \rightarrow aab$,

$B \rightarrow Ac$

Module – III

19. Design a TM to accept language $L = \left\{a^n b^n a^n b^n : n \geq 0\right\}$. 10

20. Explain Halting problem of Turing machine. Show that Turing machine halting problem is undecidable. 10

OR

21. Define Standard Turing machine. Design a Turing machine for the function

$f(m, n) = m - n$ for $m \geq n$ and zero for $m < n$. 20