KUMARAGURU
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Register Number:……

B.E DEGREE EXAMINATIONS: NOV/DEC 2014

(Regulation 2009)

Fifth Semester

COMPUTER SCIENCE & ENGINEERING

CSE111: Theory of Computation

Time: Three Hours **Maximum Marks: 100**

Answer all the Questions:-

PART A (10 x 1 = 10 Marks)

1. Finite Automata is used to build ----------

   a) Lexical Analyzers b) Parsers

   c) Linkers d) Loaders

2. Finite Automata is a recognizer of

   a) Regular expressions b) Context Free Grammars

   c) Context Sensitive Grammars d) Phrase Structured Grammars

3. The highest precedence operator of regular expression is

   a) Union b) Star

   c) Concatenation d) Multiplication

4. The regular expression for the language accepting all combinations of a's and b's with two a's

   a) a* b) (a+b)*

   c) a(a+b)*a(a+b)* d) (a+b)*a

5. A context free language L is said to be ---------- if all its grammars are ambiguous.

   a) Ambiguous b) Derivation

   c) Inherently Ambiguous d) Parse Tree

6. The language accepted by PDA is

   a) Context free languages
   b) Unstructured Grammar
   c) Recursive languages
   d) Recursively Enumerable languages

7. The useless symbol in the grammar G with the productions {S→AB|a, A→b}

   a) S
   b) A
   c) B
   d) b

8. Turing Machine can be used as a

   a) Stored Program Computer
   b) Language Recognizer
   c) Comparator Circuit
   d) Counter

9. Recursive languages are subset of

   a) Recursively enumerable
   b) Recursively enumerable but not recursive
   c) Context free grammars
   d) Irregular grammars

10. All nontrivial properties of the RE languages are

    a) Decidable
    b) Undecidable
    c) Partial Functions
    d) Semidecidable

PART B (10 x 2 = 20 Marks)

11. List the differences between NFA and DFA.

12. Construct a NFA for all strings over the alphabet Σ = {a, b} that contains a substring '**ab**'.

13. State pumping lemma for regular languages.

14. What is Homomorphism?

15. Construct the CFG for the language L={ $a^n b^n$ | n>=1}.

16. Define Instantaneous Description (ID) of PDA.

17. Define Greibach Normal Form (GNF).

18. What are the closure properties of CFL?

19. When a language is said to be recursively enumerable?

20. Define Diagonalization Language.

PART C (5 x 14 = 70 Marks)

21. a) (i) Convert the following NFA to a DFA. (7)

δ	a	B
p	{p}	{p, q}
q	{r}	{r}
r	Φ	Φ

(ii) Prove that, If L is accepted by an NFA with ξ transitions, then L is accepted by NFA without ξ transitions. (7)

(OR)

b) (i) Prove the equivalence of NFA and DFA. (7)

(ii) Construct a DFA equivalent for the given ξ –NFA. (7)

δ	a	b	ξ
q0	q0	-	q1
q1	-	q1	q2
q2	q2	q2	-

22. a) Convert the regular expression **(a+b)*abb** into NFA and find the equivalent minimized DFA.

(OR)

b) (i) Discuss in detail about the closure properties of regular language. (8)

(ii) Show that L = { $0^i 1^j$ | i > j } is not regular. (6)

23. a) (i) Define ambiguous grammar. Show that the following grammar is ambiguous. (6)

S→ aSbS | bSaS | ξ

(ii) Construct PDA for the language $\{wcw^R \mid w \text{ in } (0+1)^*\}$ by empty stack. (8)

(OR)

b) (i) Explain the equivalence between PDA and CFG (6)

(ii) Construct PDA for the grammar S → AA | a, A→ SA | b (8)

24. a) (i) Find the GNF equivalent of the grammar (7)

S → AA | 0 A → SS |1

(ii) Design a Turing Machine to accept the language $L=\{0^n1^n \mid n>=1\}$ (7)

(OR)

b) (i) Simplify the following grammar and find its equivalent in CNF (7)

S → AB | CA B → BC | AB A → a

C → aB | b

(ii) Design a Turing machine to perform proper subtraction. (7)

25. a) (i) Show that the language L_d is not a Recursively enumerable language. (8)

(ii) Prove L_{ne} is recursively enumerable. (6)

(OR)

b) (i) Prove that the universal language is recursively enumerable. (8)

(ii) Define Post Correspondence Problem. Let Σ = {0, 1}. Let A and B be the lists of three strings each, defined as (6)

	List A	**List B**
i	w_i	x_i
1	1	111
2	10111	10
3	10	0

Does this PCP have a solution?

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