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**Question Paper Code : 10270**

B.E./B.Tech. DEGREE EXAMINATION, MAY/JUNE 2012.

Seventh Semester

Information Technology

CS 2303/CS 53/CS 1303/10144 CS 504 — THEORY OF COMPUTATION

(Common to Fifth Semester Computer Science and Engineering)

(Regulation 2008)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What is proof by contradiction?

2. Define $\varepsilon$ - closure (q) with an example.

3. Construct NFA for the regular expression a* b*.

4. Is regular set is closed under complementation? Justify.

5. Specify the use of context free grammar.

6. Define parse tree with an example.

7. State pumping lemma for CFL.

8. What is chomsky normal form?

9. Mention the difference between P and NP problems.

10. What is recursively enumerable language?

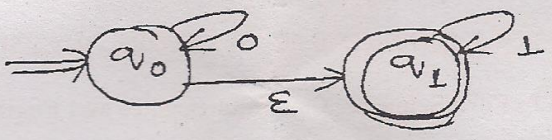
PART B — (5 × 16 = 80 marks)

11. (a) (i) Prove by induction on $n$ that $\sum_{i=o}^{n} i = \frac{n(n+1)}{2}$ (6)

(ii) Construct a DFA accepting binary strings such that the third symbol from the right end is $\perp$. (10)

Or

(b) (i) Construct an NFA without $\varepsilon$ - transitions for the NFA give below.




(8)

(ii) Construct an NFA accepting binary strings with two consecutive o's. (8)

12. (a) (i) Obtain minimized finite automata for the regular expression (b/a)* baa. (10)

(ii) Prove that there exists an NFA with $\varepsilon$ - transitions that accepts the regular expression $\gamma$. (6)

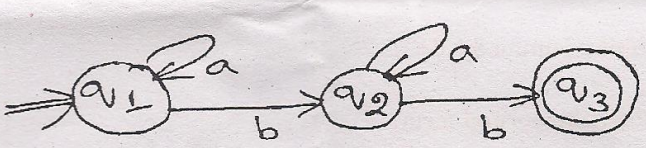
Or

(b) (i) Which of the following languages is regular? Justify.

(1) $L = \{a^n b^m / n, m \geq \perp\}$

(2) $L = \{a^n b^n / n \geq \perp\}$. (8)

(ii) Obtain the regular expression for the finite automata. (8)



13. (a) (i) Is the grammar $E \rightarrow E + E / E * E / id$ is ambiguous? Justify your answer. (6)

(ii) Find the context free languages for the following grammars.

(1) $S \rightarrow asbs / bsas / \varepsilon$

(2) $S \rightarrow asb / ab$ (10)

Or

(b) (i) Construct the PDA for L = {ww$^R$/ w is in (a+b)*} (10)

(ii) Discuss the equivalence between PDA and CFG. (6)

14. (a) (i) Find Greibach normal form for the grammar.

$S \rightarrow AA / \perp$

$A \rightarrow SS / \theta$ (10)

(ii) Explain any two higher level techniques for Turing machine construction. (6)

Or

(b) (i) Construct Turing machine for

$L = \left\{ \perp^n \theta^n \perp^n / n \geq \perp \right\}$ (10)

(ii) Discuss the closure properties of CFLS. (6)

15. (a) (i) Explain undecidability with respect to post correspondence problem. (8)

(ii) Discuss the properties of recursive languages (8)

Or

(b) (i) Explain any two undecidable problems with respect to Turing machine. (8)

(ii) Discuss the difference between NP-complete and NP-hard problems. (8)

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