

Reg. No. : 22508104014

Question Paper Code : 53106

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2010

Fifth Semester

Computer Science and Engineering

CS 2303 — THEORY OF COMPUTATION


(Regulation 2008)

Time : Three hours

Maximum : 100 Marks

Answer ALL questions

PART A — (10 × 2 = 20 Marks)

1. What is inductive proof?
2. Find the set of strings accepted by the finite automata.

3. Give the regular expression for set of all strings ending in 00.
4. State pumping lemma for regular set.
5. Write down the context free grammar for the language $L = \{a^n b^n \mid n \geq 1\}$.
6. Is the grammar $E \rightarrow E + E \mid id$ is ambiguous? Justify.
7. What is Turing machine?
8. Is the language $L = \{a^n b^n c^n \mid n \geq 1\}$ is context free? Justify.
9. What is recursively enumerable language?
10. Mention the difference between decidable and undecidable problems.

PART B — (5 × 16 = 80 Marks)

11. (a) (i) Construct the deterministic finite automata for accepting the set of all strings with three consecutive 0's. (10)
 (ii) Distinguish NFA and DFA with examples. (6)

Or

- (b) (i) Consider the finite automata transition table shown below with $F = \{q_0\}$

States	Inputs	
	0	1
q_0	q_2	q_1
q_1	q_3	q_0
q_2	q_0	q_3
q_3	q_1	q_2

Handwritten notes: $q_0 \rightarrow q_2 \rightarrow q_1 \rightarrow q_0$ and $q_1 \rightarrow q_3 \rightarrow q_2 \rightarrow q_1$

Find the language accepted by the finite automata. (10)

- (ii) What is ϵ -closure (q)? Explain with an example. (6)
12. (a) (i) Let r be a regular expression. Prove that there exists an NFA with ϵ -transitions that accepts $L(r)$. (10)
 (ii) Is the language $L = \{a^n b^n \mid n \geq 1\}$ is regular? Justify. (6)

Or

- (b) (i) Construct the minimal DFA for the regular expression $(b|a)^* baa$. (10)
 (ii) Prove that regular sets are closed under substitution. (6)

13. (a) (i) Let G be the grammar
 $S \rightarrow aB|bA$
 $A \rightarrow a|aS|bAA$
 $B \rightarrow b|bS|aBB$
 for the string $baaabbabba$. Find leftmost derivation, rightmost derivation and parse tree. (9)
 (ii) What is deterministic PDA? Explain with an example. (7)

Or

Handwritten note: Substitution

Handwritten note: Substitution

(b) (i) Construct the PDA for the Language $L = \{wcv^R \mid w \text{ is in } (0+1)^*\}$. (10)

(ii) Let L is a context free language. Prove that there exists a PDA that accepts L . (6)

14. (a) (i) Obtain a Greibach normal form grammar equivalent to the context free grammar

$$S \rightarrow AA \mid 0$$

$$A \rightarrow SS \mid 1 \quad (8)$$

(ii) Construct the Turing machine for the language $L = \{1^n 0^n \mid n \geq 1\}$. (8)

Or

(b) (i) Explain the closure properties of context free languages. (8)

(ii) Construct the Turing machine for the language

$$L = \{ww^R \mid w \text{ is in } (0+1)^*\}. \quad (8)$$

15. (a) (i) Explain the difference between tractable and intractable problems with examples. (10)

(ii) What is halting problem? Explain. (6)

Or

(b) (i) Explain post correspondence problem with an example. (8)

(ii) Explain any four NP-Complete problems. (8)