C 37069

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Name..............................

Reg. No..............................

FOURTH SEMESTER B.TECH. (ENGINEERING) DEGREE EXAMINATION, JUNE 2004

CS. 2K. 403/PTCS. 2K. 403—THEORY OF COMPUTATION

(New Scheme)

Time : Three Hours

Maximum : 100 Marks

Answer **all** *questions.*

Assume suitable data that are not given.

I. (a) Prove by induction on n that

$$\sum_{i=0}^{n} i = \frac{n(n+1)}{2}.$$

(b) State pumping lemma for regular languages.

(c) Explain Chomsky hierarchy of languages.

(d) Prove that context-free languages are closed under union, concatenation and Kleene's closures.

(e) Explain the post correspondence problem.

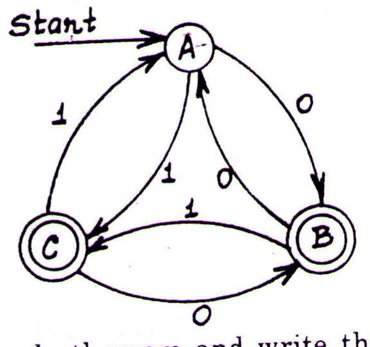
(f) Give the relations among complexity measures.

(g) Explain the terms validity and satisfiability.

(h) Write the symbols of predicate calculus.

(8 × 5 = 40 marks)

II. (a) (i) Construct regular expressions corresponding to the state diagram given below :



(8 mark

(ii) State the Myhill—Nerode theorem and write the algorithm for marking pairs inequivalent states.

(7 mark

Or

(b) (i) Construct minimal dfa for the regular expression.

$(ab / ba)^{*} (a / b)$

(8 mar

Turn o

(ii) Construct a finite automation that accepts the language generated by the gram

S → a A

A → ab B/b

B → aA/a.

(7 m

III. (a) (i) Construct PDA for the Language $L = \{x \in \{a, b\}^* \mid n_a(x) > n_b(x)\}$ (8 m

(ii) Use pumping lemma to show that the language given below is not a

$L = \{a^n b^{2n} a^n \mid n \geq 0\}$

(7 m

Or

(b) (i) Design Turning machine to implement the language $\{a^n b^n c^n \mid n \geq 1\}$

(8 m

(ii) Convert the grammar.

S → S Ab | a

A → aaA | Sa in to GNF form.

(7

IV. (a) (i) Show that there is no algorithm for deciding if any two Turning machines M_1 accept the same language.

(8

(ii) Explain the unsolvable Tiling problem. (7

Or

(b) Explain the integer programming and show how it is a NP—complete problem.

(15

V. (a) (i) Construct truth-table for the formula given below :

$\neg(\neg A \vee \neg(\neg B \vee \neg A))$

(8

(ii) Convert to conjunctive normal form

$(A \vee (\neg B \wedge (C \vee (\neg D \wedge E))))$

(7

Or

(b) (i) Convert to clause form

$\neg (\forall x\, \exists y\, P_{xy} \rightarrow (\forall y\, \exists z \neg Q_{xz} \wedge \forall y \neg \forall z\, R_{yz}))$

(8

(ii) Find all resolvent of

$\{P_x f(x) z_1 P_{uwu}\}, \{\neg P_{xyz}, \neg P_{zzz}\}$

(7

[4 × 15 = 60