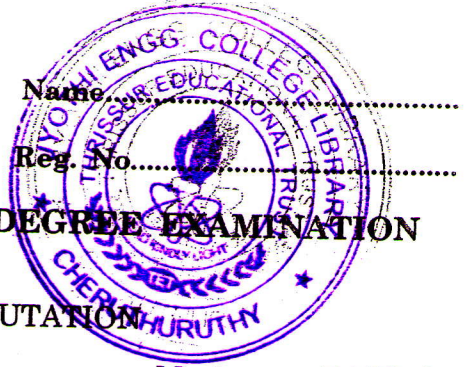**C 48101**

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FOURTH SEMESTER B.TECH. (ENGINEERING) DEGREE EXAMINATION
JUNE 2008

CS/PTCS 2K 403—THEORY OF COMPUTATION

Time : Three Hours

Maximum : 100 Marks

Answer all questions.
Assume suitable data that are not given.

I. (a) Define countable, uncountable sets and regular expression.

   (b) Define : Homomorphism substitution.

   (c) Outlined CYK algorithm.

   (d) Give CFG, accepting the following languages :

        (i) $(0 + 1)*$

        (ii) $(0 + 1)* 101 (0 + 1)*$

        (iii) String of 0's and 1's length at most 3.

   (e) Define undecidability with related features.

   (f) Define NP set of problems.

   (g) Symbolise the statement in predicate calculus

        A is the father of the mother of Y.

   (h) S.T.

$$(x)(P(x) \rightarrow Q(x) \wedge (x)Q(x) \rightarrow R(x))$$
$$\Rightarrow (x)(P(x) \rightarrow R(x))$$

(8 × 5 = 40 marks)

II. (a) (i) Explain how we can construct DFA from NFA in detail.   (10 marks)

        (ii) Define Regular grammar with examples.   (5 marks)

Or

   (b) (i) Show that $L = \{0^i 1^i / i >= 1\}$ is not regular.   (10 marks)

        (ii) Explain pumping Lemma with any usage.   (5 marks)

III. (a) (i) Explain the equivalence of LBA and CSG.   (9 marks)

        (ii) Prove that $\{a^P / P \text{ is prime}\}$ is not context free.   (6 marks)

Or

   (b) (i) Explain various closure properties of CFLS.   (8 marks)

        (ii) Construct a turing machine that accepts language $L = \{w = W \in \{a,b\}^*$ and the number of a's in w are equal to the number of b's$\}$ (7 marks)

Turn over

IV. (a) (i) Compare recursive and recursively enumerable languages. (8 marks)

(ii) Use reduction to prove that the following problem about turing machine is unsolvable. Given a turing machine M, does M halt on the empty tape ?

(7 marks)

(b) (i) Explain post correspondence problem in detail. (8 marks)

(ii) If L is recursively enumerable, then there exists on unrestrained grammar. G such that L = L(G).

(7 marks)

V. (a) (i) Explain various normal forms with examples. (6 marks)

(ii) Discuss travelling salesmen problem in detail. (9 marks)

Or

(b) (i) Find the prenex formula for $\exists x \neg (\forall y\, Pxyz \supset \exists \cup Q\, x \cup) \wedge (\forall t \neg \forall v(At \vee B\, v)$. (9 marks)

(ii) Convert to disjunctive normal form $((A \vee B) \wedge (C \wedge D))$. (6 marks)

[4 × 15 = 60 marks]