

C 32269**(Pages : 2)****Name.....****Reg. No.....**

**FIFTH SEMESTER B.TECH. (ENGINEERING) (04 SCHEME)
DEGREE EXAMINATION JUNE 2007**

CS 04 506 – THEORY OF COMPUTATION

(2004 Admissions)

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

Answer all the questions.

- I. (a) Define a regular expression. Give a regular expression r such that $L(r) = \{w \in \{0, 1\}^* / w \text{ has at least one pair of consecutive zeros}\}$
- (b) Define NDFA. Give an example.
- (c) Define an ambiguous CFG and inherently ambiguous CFL. Give examples.
- (d) Convert the grammar $S \rightarrow aSb/ab$ into Chomsky normal form.
- (e) Show that, if a language is not recursively enumerable, its complement cannot be recursive.
- (f) Define a non-deterministic Turing machine. Give example.
- (g) Define NP-hard and NP-Complete problems. Give examples.
- (h) Explain the directed hamiltonian circuit problem. Is it NP-Complete or hard problem?
(8 × 5 = 40 marks)

- II. (a) (i) Find an NDFA with three states that accepts the language.

$$L = \{a^n/n \geq 1\} \cup \{b^m a^k/m \geq 0, k \geq 0\}$$

(7 marks)

- (ii) Construct a DFA that accepts the language generated by the grammar:

$$S \rightarrow abA, A \rightarrow bAB, B \rightarrow aA/bb.$$

(8 marks)

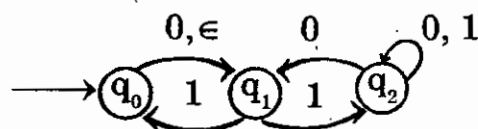
Or

- (b) (i) Find an NDFA that accepts the language $L(aa^*(a+b))$.

(8 marks)

Turn over

(ii) Convert the following N DFA into an equivalent DFA:



(7 marks)

III. (a) Construct a PDA to recognize the language generated by the grammar:

$S \rightarrow aA, A \rightarrow aABC / bB / a, B \rightarrow b$ by empty stack.

(15 marks)

Or

(b) (i) Construct a PDA to accept the language $L = \{ww^R / w \in \{a, b\}^*\}$ by final state.

(12 marks)

(ii) State the pumping lemma for CFL.

(3 marks)

IV. (a) Design a Turing machine for computing the function $f(x, y) = x - y$.

Or

(b) Define the language L_u . Show that L_u is recursively enumerable.

(15 marks)

V. (a) Show that the class of NP-hard problems \neq class of NP - Complete problems.

Or

(b) State node cover decision problem. Show that it is NP-Complete.

(15 marks)

(4 × 15 = 60 marks)