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Name: ....

Reg.No. ....
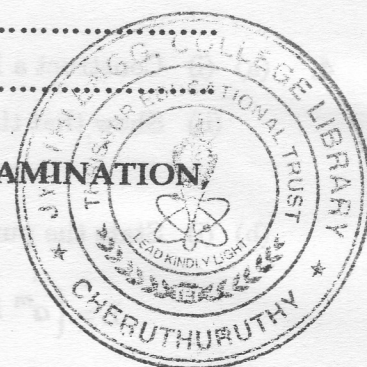
FIFTH SEMESTER B.TECH (ENGINEERING) DEGREE EXAMINATION, DECEMBER 2010

CS 04 506 – THEORY OF COMPUTATION
(2004 ADMISSIONS)

Time: 3 Hours   Maximum: 100 Marks

1. (a) Define NDFA. Give an example.

    (b) Convert the grammar $S \rightarrow AB/aB$, $A \rightarrow aab$ and $B \rightarrow bbA$ into Chomsky normal form.

    (c) Explain post's correspondence problem with an example.

    (d) What is the importance of study of NP complete problems ?

    (e) Define a context free grammar. Give CFG to generate the set of palindromes over the alphebet.

    (f) Define a Turing Machine. Give example.

    (g) Distinguish between NP hard and NP-complete problem.

    (h) Explain node cover decision problem. Show that it is an NP-problem. $(8 \times 5 = 40 \text{ marks})$

2. (a) (i) Give the algorithm for minimizing the states of DFA.   (10 marks)

         (ii) Construct a regular expression for the state diagram :
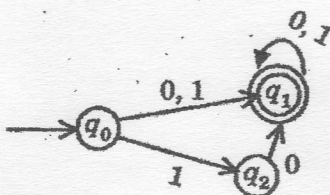
                                                                                          (5 marks)

                                             Or

    (b) (i) Construct a NDFA equivalent to the regular expression 01* + 1.   (9 marks)

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

              $S \rightarrow aA/a$, $A \rightarrow abB$ and $B \rightarrow bS$.

                                                                                          (6 marks)

3. (a) Show that directed Hamiltonian circuit problem is NP-complete.   (15 marks)

                                             Or

    (b) (i) Define P and NP problem. Give example.   (5 marks)

         (ii) State the halting problem. Show that it is not NP-complete.   (10 marks)

4. (a) (i) Construct a PDA equivalent to the grammar : S → aAA, A → aS/bS/a. (10 marks)

(ii) Show that the grammar S → aSb/SS/ϵ is ambiguous. (5 marks)

Or

(b) (i) State the pumping lemma CFL and show that the language :

$$L = \left\{ a^m\, b^n\, c^m\, b^n \,/\, m \geq 1 \text{ and } n \geq 1 \right\}$$

is not context free.

(10 marks)

(ii) Let G be the grammar S → aB/bA, A → a/aS/bAA, B → b/bS/aBB. For the string aaabbabbba, find a parse tree.

(5 marks)

5. (a) Discuss briefly the different types of Turing machines.

Or

(b) Design a Turing machine that accepts the language $L = \left\{ a^n b^n a^n b^n / n \geq 0 \right\}$.

(15 marks)

[4 × 15 = 60 marks]

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