15292

Name: ....

Reg.No. ....

FOURTH SEMESTER B.TECH DEGREE EXAMINATION, DECEMBER 2010

CS/IT 2K 405 – COMPUTER ORGANIZATION AND DESIGN

Time : Three Hours | Maximum: 100 Marks

PART – A

I. (a) The number a_n for $N >= 0$ are defined recursively as follows $a_0 = -2$, $a_1 = -2$, for $n >= 2$, $a_n = 5a_n - 6a_{n-2}$. Show that for every $n >= 0$ $a_n = 2 * 3^n - 4 * 2^n$

(b) Distinguish between NFA and DFA. Draw a DFA for the regular expression (1110+11)*0.

(c) What are normal forms? Define the two normal forms.

(d) Define Context sensitive Language and Linear bounded automation.

(e) Show that the family of recursive languages is closed in union and intersection.

(f) State the Post correspondence problem and explain it with an example.

(g) Write the formulas of the propositional calculus and explain it with an example.

(h) State and prove the unification theorem.

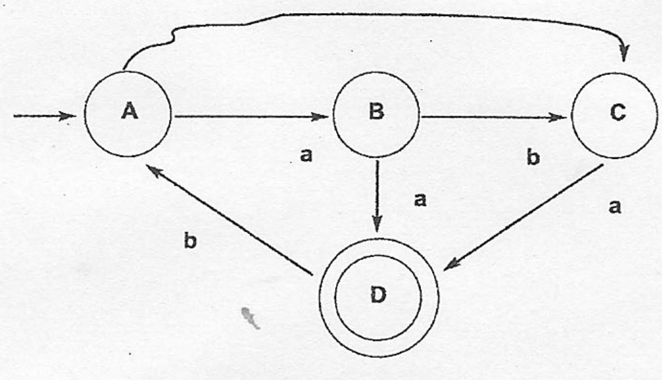
$(8 \times 5 = 40)$

PART – B

II. (a) (i) Consider two regular expressions r1=0*/1, r2=01*/10*/1*0/(0*1)*. Find a language corresponding to (i) both r1 and r2 (ii) neither r1 or r2.

(ii) State the pumping lemma for regular languages and use it to prove that the language $a^n b^n c^n$ is not regular.

(iii) Convert the NFA given below to DFA and identify the strings accepted by it.



(OR)

(b) (i) State and prove the theorem of equivalence of Finite automation and Regular Expression.

(ii) Find a minimum state automation to recognize the language corresponding to the regular expression (0*10+1*0)(01)*.

(iii) Write the algorithm for marking pairs of in equivalent states and explain its use in construction of minimized state automation.

III (a) (i) Construct a PDA corresponding to the grammar {S →aABB/aAA, A→aBB/aA/b, B →bBB/Aa/a} and trace a valid string using the PDA constructed.

(ii) Prove that if M is a PDA recognizing a CFL then there exist an equivalent CFG that can be generated using M to recognize L.

(OR)

(b) (i) Construct a Turing machine that will accept a language of {a, b}* such that L={w:|w| is a multiple of 3}

(ii) Write the rules of a Turing machine that recognize a two way infinite tape machine with an equivalent one way infinite tape machine.

IV. (a) Prove that Post correspondence problem is undecidable.

(b) Explain the Turing Machine Halting problem.

(OR)

(b) (i) Show that the problem of determining whether or not $L(G_1) \subseteq L(G_2)$ is undecidable for context free grammars G_1, G_2.

(ii) Explain the Bounded Tiling problem and prove that it is NP-complete.

V. (a) (i) Explain the concept of Validity and satisfiability using suitable examples.

(ii) Rewrite the formulas (i) $((A \wedge \neg B \wedge A) \vee (\neg A \wedge B \wedge \neg C))$ (ii) $\neg(A \wedge B \wedge \neg C)$ as clause sets.

(OR)

(b) (i) Explain the Harbrand's Expansion theorem.

(ii) State and explain the Resolution Theorem for Predicate Calculus.

$(4 \times 15 = 60)$

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