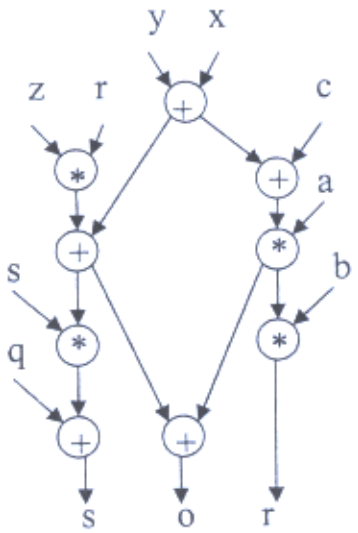
93學年度國立成功大學 電機工程學系—丁組 離散數學 試題 共 1 頁 第 1 頁
研究所招生考試 電腦與通信所—甲組

1. Solve the following recurrence relations.(15%)

$$a_{n+2}^2 - 5a_{n+1}^2 + 6a_n^2 = 7n, \quad n \geq 0, \quad a_0 = a_1 = 1$$

2. Please derive the minimum state diagram of a mealy-style clocked sequential circuit that recognizes the input sequence consisting of exactly two zeros followed by a 10. (15%)

3. Please derive a fastest scheduling (i.e., a minimum state diagram) and the minimum number of registers used in the scheduling for the following data flow graph using 1 adder and 1 multiplier with a graph theoretic approach. Assume both the adder and the multiplier have one clock cycle delay. (Hint : use graph coloring) (15%)



4. Let (A, R) be a poset in which the length of longest chain is n. Use mathematical induction to prove that the elements of A can be partitioned into n antichains C_1, C_2,…,C_n (where $C_i \cap C_j = \emptyset$, for $1 \leq i < j \leq n$).
Definition of antichain: let (A, R) be a poset, and let $\phi \neq C \subseteq A$. If $(C \times C) \cap R = \phi$, then for all distinct x, $y \in C$ we have $x \not R y$ and $y \not R x$. The elements of C are said to from an antichain in the poset (A, R). (10%)

5. (a) Find a graph G where both G and $\overline{G}$ are connected.
(b) If G is a graph on n vertices, for $n \geq 2$, and G is not connected, prove that $\overline{G}$ is connected. (20%)

6. Find the generating functions for the sequence 1, -2, 3, -4, 5, -6, 7,…. (10%)

7. How many ways can we have to pattern 2 colors in the vertices of a cube? (15%)

9 EI01 2-2
EI03