TEL AVIV UNIVERSITY אוניברסיטת תל-אביב
THE IBY AND ALADAR FLEISCHMAN FACULTY OF ENGINEERING
DEPT. OF ELECTRICAL ENGINEERING-SYSTEMS
הפקולטה להנדסה ע"ש איבי ואלדר פליישמן
המחלקה להנדסת חשמל-מערכות

Introduction to Digital Computers - Fall 1997

Assignment No. 1

Course homepage: http://www.eng.tau.ac.il/~guy/Digital_Computers/dc_home.html

Deadline: March 17th

1. Prove that:
$$Q_q(A, B, \Pi) = \frac{P(A, B, \Pi)^{1-q}}{C(A, B)^q}$$

2. Prove that:
   (a)
$$eq = \frac{\log P(A, B, \Pi)}{\log(P(A, B, \Pi) \cdot C(A, B))}$$
   (b) If $q < eq$ then $Q_{q,B}(\Pi) < Q_{q,A}(\Pi)$.
   (c) If $q > eq$ then $Q_{q,B}(\Pi) > Q_{q,A}(\Pi)$.

3. A path in a circuit is a sequence of gates $G_0, G_1, \ldots, G_p$ such that an input of gate G_{i+1} is fed from an output of gate G_i. A cycle is a closed path, namely, a path in which $G_0 = G_p$. Prove that a combinational circuit does not contain cycles.

4. Write (on paper) a (recursive) algorithm that is given as input a circuit and outputs whether it is a combinational circuit. If the circuit is a combinational circuit, then the algorithm outputs the ordered sequence of gates in the circuit $G_1, G_2, \ldots$ (according to the definition of a combinational circuit).

   Prove the correctness of your algorithm.

5. Write (on paper) a (recursive) algorithm that is given as input a combinational circuit and outputs the delay of the circuit. Prove the correctness of your algorithm. (You may use the algorithm from Question 4 as a procedure).

קרית האוניברסיטה, ת.ד. 39040, רמת-אביב, תל-אביב 69978. טל' 03-6408764, פקס' 972-3-6407095
P.O.B. 39040, RAMAT AVIV, TEL AVIV 69978, ISRAEL; TEL. 972-3-6408764, FAX. 972-3-6407095