Assignment 7

Post Date: 30 May 2016  Due Date: 6 June 2016  Tutorial: 8 June 2016

Problem 1: MacLane’s Planarity Criterion 6 Points

Let $G$ be a biconnected plane graph and let $B_I$ be the set of the inner facial cycles of $G$.

(a) Show that $B_I$ generates the cycle space of $G$.

(b) Show that $|B_I|$ equals the dimension of the cycle space.

(c) Show that $K_5$ does not have a 2-basis.

(d) Show that $K_{3,3}$ does not have a 2-basis.

Hint for (c) and (d): Add a linear combination of the elements to the cycle basis and use a counting argument.

Problem 2: Cycle and Cut Bases 4 Points

Consider the following graph $G = (V, E)$:

(a) Find a basis for the cycle space, which is not a fundamental cycle basis with respect to any spanning tree of $G$.

(b) Express $E$ as the symmetric difference of a cycle and a cut.

(c) Give a basis of the cut space of $G$. 