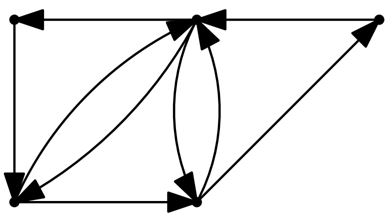
2413-110 Discrete Mathematic

Quiz 2 20/Feb/2009 11:05 – 12:30 (85 minutes)

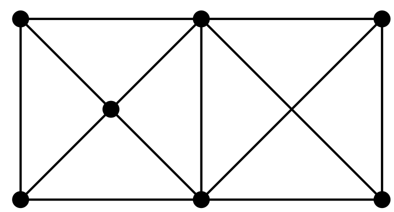
Name ____ Sect _____ ID ____________________

Notes

- This paper has 1 question page (this page) and 3 blank sheets. **Write down your name and ID on top of every page**.
- Write down your answer **only** in the blank sheet.
- No calculator, closed book, and don't bring any paper in.
- Cheating will not be tolerated.



(a) The graph for problem 3



(b) The graph for problem 6

1. (1 point) The **intersection graph** of a collection of sets $A_1, A_2, \ldots, A_n$ is the graph that has a vertex for each of these sets and has an edge connecting the vertices representing two sets if these sets have a nonempty intersection. Construct the intersection graph of this collection of sets
$A_1 = \{2, 4, 6, 8\}$, $A_2 = \{0, 1, 2, 3, 4\}$, $A_3 = \{1, 3, 5, 7, 9\}$, $A_4 = \{5, 6, 7, 8, 9\}$, $A_5 = \{0, 1, 8, 9\}$

2. (1 point) Determine whether the graphs without loops with these **incidence matrices** are isomorphic.
$$\begin{bmatrix} 1 & 0 & 1 \\ 0 & 1 & 1 \\ 1 & 1 & 0 \end{bmatrix}, \begin{bmatrix} 1 & 1 & 0 \\ 1 & 0 & 1 \\ 0 & 1 & 1 \end{bmatrix}$$

3. (1 points) Determine whether the directed graph in Figure (a) has an Euler circuit. Construct an Euler circuit if one exists.

4. (2 points) Show that the chromatic number of any tree does not exceed two.

5. (2 points) Suppose that T is a full m-ary tree. Let i be the number of internal vertices, l be the number of leaves and n be the number of all vertices. Show that, if i and m are given, then $n = mi + 1$ and $l = (m - 1)i + 1$.

6. (2 points) A clique in a simple undirected graph is a complete subgraph that is not contained in any larger complete subgraph. Find all cliques in the graph shown in Figure (b).

7. (3 points) Construct the ordered rooted tree whose preorder traversal is a,b,f,c,g,h,i,d,e,j,k,l, where a has 4 children, c has 3 children, j has 2 children, b and e have 1 child each, and all other vertices are leaves.

8. (3 points) Suppose that G_1 and H_1 are isomorphic and that G_2 and H_2 are isomorphic. **Prove or disprove** that $G_1 \cup G_2$ and $H_1 \cup H_2$ are isomorphic.