King Fahd University of Petroleum and Minerals
Department of Mathematical Sciences
Math 425 Exam II Spring 2013(032)

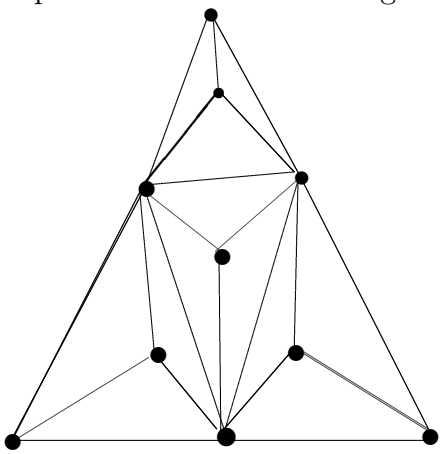
ID#:_____ NAME:_____

(1) (a) Define:
(i) an Eulerian circuit (ii) edge connectivity (iii) k-connected graph (iv) a strong digraph

(b) State:

(i) Menger's Theorem (ii) Whitney's Theorem (iii) Robbin's Theorem

(2) Consider the graph G in the figure below:
(a) Either construct a Hamiltonian cycle or prove that G is not Hamiltonian.
(b) What is the minimum number of edges we need to add to make G an Eulerian?
(c) Is it possible to direct the edges of G to make it strongly connected? How?



(3) For what value(s) of n are the following graphs Hamiltonians and for what value(s) of n are they Eulerians?
(a) $K_{n,2n,3n}$ (b)$K_{n,2n,3n+1}$

(5) Prove each of the following statements:
(a) A tournament is strongly connected if and only if it contains a Hamiltonian cycle.
(b) If G is Eulerian graph, then every cut-set S of G must have an even number of edges.
(c) If G is a graph of order $n \geq 2$ such that for all distinct nonadjacent vertices u, v $degu + degv \geq n - 1$, then $\lambda(G) = \delta(G)$.

(6) Find (the connectivity) $\kappa(G)$ and (independence number) $\alpha(G)$ if G is:
(a) K_n (b) $K_{s,t}$ (c) C_n (d) P_n

(7) Let G be a graph on 8 vertices. If G is 2-connected, how many edges must G have? Show why?