

BACHELOR OF ENGG. INFORMATION TECHNOLOGY EXAMINATION, 2018
 (3rd Year, 1st Semester)
 Graph Theory

Time: 3 hrs.

Full Marks: 100

Answer any Four Questions

1. a. Prove or disprove (i) K_5 is non-planer (ii) $K_{3,3}$ is planer. (5+5)
 b. What is Chromatic Number of a Graph? Find out the chromatic number for following graphs: (i) K_n (ii) Circuit Graphs (iii) Tree (iv) $K_{m,n}$. Justify your answer for each case. (2+ 4 X 2 = 10)
 c. Prove that "tree is a bipartite graph". (5)
2. a. A graph G is Eulerian if and only if it has at most one nontrivial component and its vertices all have even degree?(10)
 b. Prove that every graph with n vertices and k edges has at least $n-k$ components. (5)
 c. Define with example, Euler Path and Euler Circuit. (5+5)
3. a. Prove or disprove that a graph is bipartite if and only if it has no odd cycle. (10)
 b. A simple graph is called regular if every vertex of this graph has the same degree. For which values of m and n is $K_{m,n}$ is regular? (5)
 c. Can five houses be connected to two utilities without connections crossing? Justify. (10)
4. a. Suppose a connected graph G is decomposed into two graphs G_1 and G_2 . Prove that G_1 and G_2 must have a common vertex. (10)
 b. Prove that every n vertex graph with at least n edges contains a cycle. (5)
 c. Let P and Q be two paths of maximum length in a connected graph G . Prove that P and Q must have a common vertex. (10)
5. a. Prove that every n -vertex graph with m -edges has at least $m-n+1$ cycles. (8)
 b. Let v be a vertex in a connected graph G . Prove that there exists a spanning tree T of G such that the distance of every vertex from v is the same in G and in T . (12)
 c. Derive the adjacency matrices for a circuit graph and a bipartite graph. (5)