UNIVERSITY OF BUEA
FACULTY OF ENGINEERING
FIRST SEMESTER EXAMINATION
DEPARTMENT: Computer ALLOWED TIME: 3 Hour
DATE: February 2013 COURSE: CEF209-Discrete Mathematics

INSBTRUCTIONS: Read through each question before you start answering. Answer all questions.

There is a penalty for wrong English and poor presentation of answers.
1. Let G be an undirected graph with loops on every vertex. Show that the relation R on the set of vertices of G such that uRv if and only if there is an edge associated with {u, v} is reflexive and symmetric.
2. The intersection graph of a collection of sets A_1, A_2,... A_n is the graph that has a vertex for each of these sets and there is an edge between vertices if and only if the intersection between the sets is a non empty set. Construct the intersection graph for these collection of sets:

3. Let A= {1,2,3}, B= {2,3,4}, and R be a relation from A to B.
(a) List the elements of A*B.
(b) List the elements of R = {(x, y)/x less than y}.
(c) Write down the domain and range
(d) Sketch the graph of R in (b)
(e) Would R also be a relation from B to A? Justify your answer.
4. Suppose that the relation R on a st A is represented by the matrix M_R. Show that:
(a) The matrix that represents the symmetric closure of R is M_R v M_R^T
(b) The matrix that represents the reflexive closure of R is M_R V I_n
5. Given V = {v1, v2, v3, v4, v5, v6} and E = {(v1, v3), (v1, v4), (v2, v3), (v2, v3), (v2, v6), (v3, v6),
(a) Sketch the graph G = {E, V}
(b) Is G a simple graph? If yes, justify your answer. If no, find a simple sub-graph H using the same set of vertices.
(c) Is G a connected graph? If yes, justify your answer. If no, find a connected graph H using the same set of vertices and which contains G as a sub-graph.
6. Draw a Bipartite Graph G with 5 vertices and 5 edges (or explain why no such graph exists), where 2 vertices belong to U, 3 vertices belong to W, and U and W are subsets of the set of all vertices V.
7. Draw a complete Bipartite Graph H with 5 vertices where 2 vertices belong to U and 3 vertices belong to W.
8. Is G, in (6) a sub-graph of H, in (7)? Are G and H actually the same graph? Justify your answers.
9. Draw a graph G consisting of four vertices {v1, v2, v3, v4} and six edges {e1, e2, e3, e4, e5, e6}, where e1= (v1, v2), e2 = (v1,v3), e3 = (v1, v4), e4 = (v2, v3), e5 = (v2, v4), and e6 = (v3, v4)}
(a) Write down the four simple paths from v1 to v2.
(b) Write down the four closed paths of length 3 from v1 to v1
Computer files can be accessed effectively when B-trees are used to represent them. A B-tree of degree K is a rooted tree such that its at are the same level, its root has at least two and at most K children unless it is a leaf and every internal vertex other than the root has
Other than the root has at least celling (k/2) but no more than k children.
10. Draw three different B-trees of degree 3 and height 4
11. Give the upper and lower bound for the number of leaves on a B-tree of degree k and height h
(6+8+10+8+6+3+3+4+10+6+6 marks)

GOOD LUCK