Mid-West University
Examinations Management Office
Surkhet, Nepal
End Semester Examination-2080

Level: B.Ed. / III Semester   FM: 60
Time: 3.00 hrs   PM: 30
Sub: Graph Theory (MATH 435/336)

Candidates are requested to give their answers in their own words as far as practicable.

Attempt All the Questions:

Group "B"   6×5 = 30

1. Define graph also, prove that the number of odd vertices in a graph is always even.

2. What is the difference between incidence matrix and adjacency matrix of a graph. Draw a graph from the adjacency matrix $\begin{bmatrix} 3 & 2 & 2 \\ 2 & 3 & 2 \\ 2 & 2 & 3 \end{bmatrix}$.

3. Define tree. If G is a tree with n vertices, then it has n-1 edges

Or

State and prove the solution of Konigsberg Bridge Problem.

4. If G is a connected planar, simple graph with $e \geq 2$, then $3r \leq 2$

5. Define graph and multigraph. How can you differentiate graph with multigraph? Construct a mathematical model.

6. A connected graph G is Eulerian if and only if each vertices has an even degree.

Or

Define digraph. Find the matrix M_D from the digraph.

Group "C"   2×10 = 20

7. Define the spanning tree of a graph. Draw the different 16 spanning trees of the complete graph K_4. Prove that a graph is connected iff it has subgraph that is a spanning tree.

8. Define isomorphic and isomorphism of graphs. Let G_1 and G_2 be isomorphic graphs, with isomorphism ϕ. Then prove that:
   (i) G_1 and G_2 have the same number of vertices.
   (ii) G_1 and G_2 have the same number of edges.
   (iii) if u is adjacent to v in G_1, then $\phi(u)$ is adjacent to $\phi(v)$ in G_2.
   (iv) if u has degree k in G_1, then $\phi(u)$ has degree k in G_2.

Or

Prove that:
(a) A connected graph G is Eulerian if and only if each vertices has even degree.
(b) The number of edges in the complete graph with n vertice is $\frac{n(n-1)}{2}$.

THE END

Mid-West University
Examinations Management Office
Surkhet, Nepal
End Semester Examination-2080
Level: B.Ed. / III Semester

Sub: Graph Theory (MATH 435/336)

Roll No: ....

Group 'A' $10 \times 1 = 10$

Tick (✓) the best answers.

1. If G is a tree with n vertices, then
   a. It has $n - 1$ edges.
   b. It has $n^2 + n - 1$ edges.
   c. It has $n + 1$ edges.
   d. n edges.

2. The complete graph K_n has ... different spanning trees.
   a. n^{n-1}
   b. n^{n-2}
   c. n^{n-3}
   d. n^{n-4}

3. "The sum of the degrees of the vertices of a graph are equal to the twice the number of edges." The statement is related to ...
   a. the Konigsberg Bridge Problem
   b. hand-shaking Theorem
   c. spanning Tree
   d. eulerian Graph

4. A walk is said to be a path ...
   a. if there is repeated vertices and edges.
   b. if there is no repeated vertices and edges.
   c. if there is no repeated vertices and repeated edges
   d. if there is repeated vertices and no repeated edges

5. The statement of the " Solution of the Konigsberg Bridge Problem " is ...
   a. the multigraph G has no trail containing all edges of G.
   b. the multigraph G has trail containing all edges of G.
   c. the multigraph G has no trail containing no edges of G.
   d. none of the above.

6. A complete graph K_n is a regular graph with degree:
   a. $n + 1$
   b. $n^2 + n - 1$
   c. $n - 1$
   d. n

7. A graph with one vertex and no edges is called ...
   a. Trivial Graph
   b. Multigraph
   c. Bipartite Graph
   d. Empty Graph

8. If G is a connected planar graph with |V| = v, |E| = e and r number of regions, then
   a. $v - e + r = 2$.
   b. $v + e - r = 2$.
   c. $v - e - r = 2$.
   d. $v + e + r = 2$.

9. Which one of the following statement is not correct?
   a. The graph has loops.
   b. The multigraph has loops.
   c. The graph without any edges and vertices is empty graph.
   d. The graph with one vertex and no edge is trivial graph10.

10. Let two graphs G_1 and G_2 are isomorphic graph with isomorphism ϕ then which one of the following statements is not correct?
   a. G_1 and G_2 have the same number of vertices.
   b. G_1 and G_2 have the same number of edges.
   c. if u is adjacent to v in G_1, then $\phi(u)$ is adjacent to $\phi(v)$ in G_2
   d. if u has degree k in G_1, then $\phi(u)$ has degree k-1 in G_2