

Mid-West University
Examinations Management Office
End Semester Exam-2082

B.Ed. Level / III Semester

Sub: Graph Theory (MATH435/336)

Roll No.

Group 'A'

10×1=10

Tick (✓) the Best Answer.

1. The total number of edges in a complete graph is
 - a. K_1
 - b. K_2
 - c. K_3
 - d. K_n
2. The multigraph G has....
 - a. a trial containing all edges of G
 - b. a trial containing an edges of G
 - c. no trial containing all edges of G
 - d. no trial containing an edges of G
3. If G is a tree with n vertices, then it has....
 - a. n edges.
 - b. $n + 1$ edges
 - c. $n + 2$ edges
 - d. $n - 1$ edges
4. If G is a connected planar graph with v vertices and e edges where $v \geq 3$, then.....
 - a. $e \leq 3v - 6$
 - b. $e = 3v - 6$
 - c. $e \geq 3v - 6$
 - d. $e \leq 3v + 6$
5. The degree of a vertex of G is denoted by....
 - a. $d(G)$
 - b. $d(v)$
 - c. $v(G)$
 - d. $n(v)$
6. An edge e of G is a bridge if and only if...
 - a. e does lie on any cycle of G.
 - b. e does not lie on any cycle of G.
 - c. e does lie on any circuit of G.
 - d. e does not lie on any circuit of G.
7. Every planar Map M is....
 - a. Two colourable
 - b. Three colourable
 - c. Four colourable
 - d. Five colourable
8. A digraph D is strongly connected if and only if....
 - a. It has a closed directed spanning path
 - b. It has a open directed spanning path
 - c. It has a closed directed spanning trial
 - d. It has a open directed spanning path
9. A vertex v is said to be a cut-vertex of a graph G if
 - a. the graph G is connected
 - b. the graph $G - v$ is connected
 - c. the graph G is disconnected
 - d. the graph $G - v$ is disconnected
10. A complete graph K_n is plannar if and only if.....
 - a. $n \leq 2$
 - b. $n \leq 3$
 - c. $n \leq 4$
 - d. $n \leq 5$

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FM: 60

Time: 3 hrs.

PM: 30

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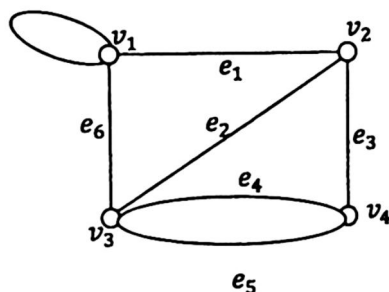
Candidates are requested to give their answers in their own words as far as practicable.

Attempt All the Questions.

Group 'B'

$$6 \times 5 = 30$$

1. Consider the multigraph $G(V, E)$ in the figure below. Find the degree and parity (even or odd) of each vertex of G .



2. Explain about bipartite and complete bipartite graph with examples. Find the total number of edges in the complete graph K_n .
3. Define adjacency matrix. Draw the graph G whose adjacency matrix A(G) is

$$\begin{bmatrix} 0 & 1 & 1 & 1 & 1 \\ 1 & 0 & 1 & 1 & 1 \\ 1 & 1 & 0 & 1 & 1 \\ 1 & 1 & 1 & 0 & 1 \\ 1 & 1 & 1 & 1 & 0 \end{bmatrix}$$

Or

State and prove “Solution of Konigsberg Bridge Problem”.

4. Define chromatic number. Let G be a graph, then prove that $\chi(G) = 2$ if and only if G is bipartite.

5. Prove that a digraph D is strongly connected if and only if it has a closed directed spanning path.
6. Prove that in any tree G , there are at least two vertices of degree 1.

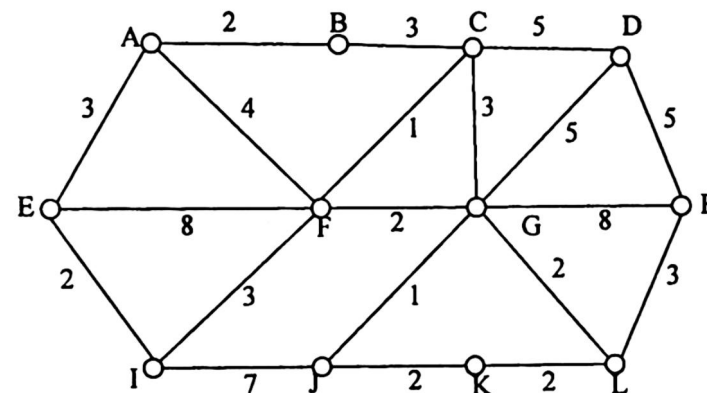
Or

Prove that a graph is connected if and only if it has subgroup that is a spanning tree.

Group 'C'

$$2 \times 10 = 20$$

7. Explain the process to solve the shortest path problem. Consider the weighted graph in the figure below, find the shortest path from E to H.



8. Define planar graph, finite region and infinite region with examples. If G is a connected planar graph with $|V| = v$, $|E| = e$ and r number of regions then prove that $v - e + r = 2$.

Or

Prove that a weakly connected digraph D with at least two vertices has a directed Euler trail iff D has two vertices u and v such that $od(u) = id(u) + 1$ and $od(v) = id(v) + 1$ and for other vertices p of D , $od(p) = id(p)$. Furthermore, in this case the trail begins at u and ends at v .

THE END