



DOON UNIVERSITY, DEHRADUN
Mid Semester Examination, 2016-2017
School of Physical Sciences
M.Sc.(Mathematics)IV-Semester
Course: MAS-251: Graph Theory

Time Allowed: 2 Hours

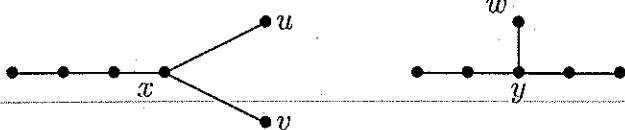
Maximum Marks: 30

Note:

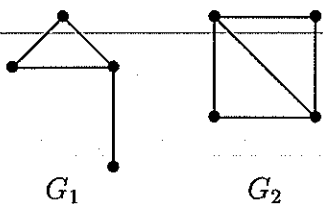
Attempt all questions from Section A, any four questions from Section B and any two questions from Section C.

Section: A (6/5 × 5 = 6 Marks)

- (1) Check the following graphs for isomorphism.



- (2) With appropriate examples explain the terms, trail, path, circuit and cycle.
 (3) Show that a regular k -graph need not be complete graph.
 (4) Find the ring sum, $G_1 \oplus G_2$ of following graphs:



Section: B (3 × 4 = 12 Marks)

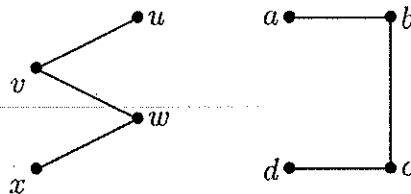
Prove following propositions:

- (1) Prove that the maximum number of edges in a simple graph is $n(n - 1)/2$, where n is the number of vertices.

- (2) Explain the Euler's solution of Königsberg Bridge Problem.
 (3) In a simple graph, $G = (V, E)$ there holds the formula

$$\sum_{v \in V} \text{deg}(v) = 2|E|.$$

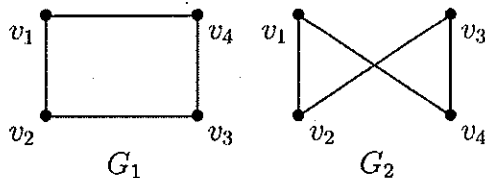
- (4) Write the isomorphism f under which following two graphs are isomorphic



- (5) Prove that if a graph has exactly two vertices of odd degree, then there must be a path joining them.

Section: C (6 × 2 = 12 Marks)

- (1) Prove that if every vertex of a graph G has degree at least 2, then G contains a cycle.
 (2) Discuss the graph isomorphism. Check whether the following graphs are isomorphic.



- (3) Show that the number of odd degree vertices in a simple graph is even.