

ED–2808

M. A./M. Sc. (Final) EXAMINATION, 2021

MATHEMATICS

(Optional)

Paper Third (i)

(Graph Theory)

Time : Three Hours

Maximum Marks : 100

Note : All questions are compulsory. Solve any *two* parts from each questions. All questions carry equal marks.

Unit—I

1. (a) Prove that if a Graph H is homeomorphic to a Graph G , then G is a contraction of H .
- (b) Show that any Homeomorphism is the product of a connected and a discrete homomorphism.
- (c) Write short notes on the following :
 - (i) Spectrum properties
 - (ii) Cycle space and bond space

Unit—II

2. (a) Show that every planar Graph is K -vertex colorable if every plane graph is K -face colorable.
- (b) Prove that any uniquely K -colorable Graph is $(K-1)$ connected.
- (c) Write short notes on the following :
 - (i) Achromatic and Adjoint numbers
 - (ii) The Rosenfeld numbers

Unit—III

3. (a) Prove that every comparability graph is perfect.
- (b) Define interval Graph Show that every interval graph is Triangulated.
- (c) Write short notes on the following :
 - (i) Ramsey numbers and Ramsey graphs
 - (ii) Forbidden Subgraph orientation.

Unit—IV

4. (a) Show that every Group is isomorphic to the automorphism group of some graph.
- (b) Prove that every vertex of a composite connected graph lies on a 4-cycle.
- (c) Write short notes on the following :
 - (i) Graph enumeration
 - (ii) Co-chromatic graph

Unit—V

5. (a) Prove that every digraph without odd cycles has a 1-basis.
- (b) Prove that a strong tournament contains cycles of all length 6 , $3 \leq C \leq n$
- (c) Write short notes on the following :
 - (i) Types of connectedness
 - (ii) Digraphs and Networks.

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