Roll No. .....

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

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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 diagraph 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.