Total pages: 02

PG CBCS
M.SC. Semester-I Examination, 2022
DEPARTMENT OF MATHEMATICS
PAPER: MTM 106
(GRAPH THEORY)
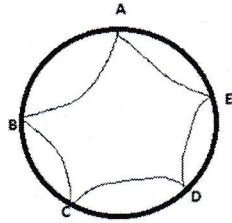
Full Marks: 20   **Time: 1 Hours**

The figures in the right-hand margin indicate full marks.
Candidates are required to give their answers in their own words as far as practicable.

1. **Answer any TWO questions from the following:**   **2×2=04**

    a) Prove that every connected graph has at least one spanning true.
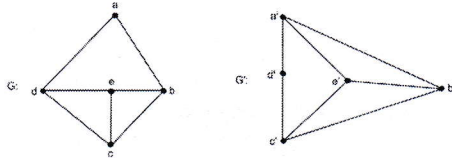   b) Find the chromatic number $\chi(G)$ of the following graph G.

    c) Find that how many 3-regular graphs are there with nine vertices.
    d) Draw the digraph G corresponding to adjacency matrix $A = \begin{pmatrix} 0 & 1 & 1 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \\ 1 & 0 & 0 & 0 \end{pmatrix}$
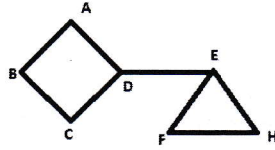
2. **Answer any TWO questions from the following:**   **2×4=08**

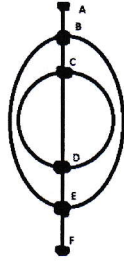   a) Show that the graphs G and G' are isomorphic

P.T.O.

b) Consider the following graph G. Find centre, diameter, cutpoints and bridge of G.

c) Define binary tree. Find the number of pendent vertices in a binary tree with n vertices.

d) Verify Euler's formula for the following graph G and also find the degree of the outside region of G.   3+1

3. **Answer any <u>ONE</u> questions from the following:**   1×8=08

   a) Find a minimal spanning tree of the following weighted graph.
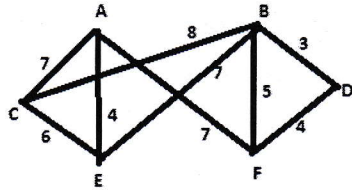
   b) (i) State and prove Euler's theorem for a connected planar graph.

   (ii) Prove that the chromatic polynomial of any cycle C_n of length n is $p_n(\lambda) = (\lambda - 1)^n + (-1)^n(\lambda - 1)$.   4+4

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