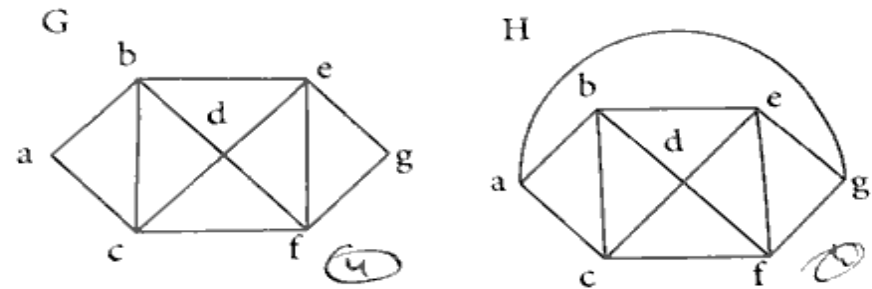


Section-B

(Short Answer Type Questions)

Note : Attempt all the 05 (five) questions out of total 08 (Eight) questions. Each question carries 05 (five) marks and answer of each question should not exceed 100 words. $5 \times 5 = 25$

2. (a) Prove that the number of vertices of odd degree in a graph G is always even.
 (b) What is the chromatic number of the graphs G and H shown below?



- (c) Show that a complete graph of n vertices is planar if $n \leq 4$.
 (d) Define the incidence matrix with example and also explain the rank of incidence matrix.
 (e) What is chromatic polynomial of a connected graph on three vertices?

C

(Printed Pages 4)

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B.C.A. (Fourth Semester)

Examination, 2025

Fifth Paper [E-1]

(Graph Theory and Combinatorics)

Time : Two Hours]

[Maximum Marks : 75

Note : Attempt all sections as per Instructions.

Section-A

(Very Short Answer Type Questions)

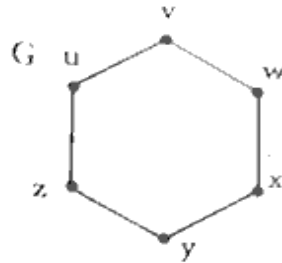
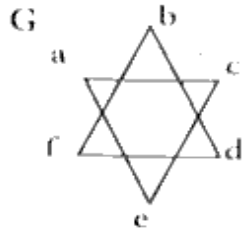
Note : Attempt all the 05 (Five) questions. Each question carries 02 (two) marks and answer of each question should not exceed 50 words. $5 \times 2 = 10$

1. (a) Define path and circuit with an example.
 (b) What is the centre of tree?
 (c) Define the planar graph.
 (d) What is chromatic number of a cycle graph?
 (e) How many nodes are necessary to construct a graph with exactly 8 edges in which each node is of degree 2?

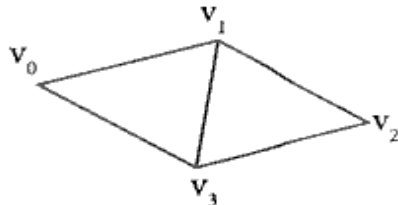
P.T.O.

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- (f) Determine whether the graph G and G' given below are isomorphic.



- (g) A computer access code word consists of from one to three letters of English alphabets with repetitions allowed. How many different code words are possible.
- (h) Find all the spanning trees of the graph given below.



Section-C

(Long Answer Type Questions)

Note : Attempt any 02 (Two) questions out of total 04 (Four) questions. Each questions carries 20 (Twenty) marks and answer of each question should not exceed 400 words.

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2×20=40

P.T.O.

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3. (a) Explain the discrete numeric function and generating function. And also evaluate the sum $1^2+2^2+3^2+\dots+r^2$ using generating functions.
- (b) (i) State and prove five colour theorem.
(ii) Show that $(p \rightarrow q) \wedge (q \rightarrow p)$ is logically equivalent to $p \leftrightarrow q$.
- (c) Explain chromatic polynomial with example and also prove that an n -vertex graph is a tree iff its chromatic polynomial is $P_n(\lambda) = \lambda(\lambda-1)^{n-1}$
- (d) There are four bus lines between A and B and three bus lines between B and C. Find the number of ways a person can travel.
- (i) By bus from A to C by way of B.
(ii) Round trip by bus from A to C by way of B.
(iii) Round trip by bus from A to C by way of B, if the person does not want to use a bus line more than once.

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