Mathematical department **Graph theory**

Q1/ Define degree set and degree sequence, is every degree sequence graphical? what's necessary condition for any sequence to be graphical? illustrate Havel–Hakimi Theorem to show that the degree sequence S: 5, 3, 3, 3, 3, 2, 2, 2, 1, 1, 1. Graphical.

Q2/ For the graph G showing below find the following:

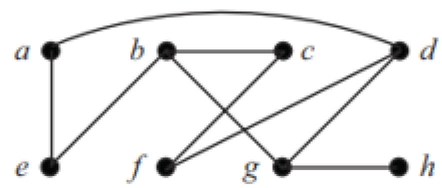

Fig.1 Graph G

1- Open neighbor N(g), N(h), N(f).
2- close neighborhood of the set S, S={ a, b, g, h}.
3- girth and circumference of G.
4- Eccentricity, radius and diameter.
5-Find factorization of G.

Q3/ Define matching, and perfect matching, and prove M is maximal if and only if there is no alternating path between two distinct weak vertices.

Q4/ Define genus, and prove if G(p,q) is connected graph, then

$\gamma \geq \frac{1}{6}q - \frac{1}{2}$(p-2), and $\gamma \geq \frac{1}{4}q - \frac{1}{2}$(p-2) if G has no triangle.

Q5/ Draw graph G of order 10, with greatest degree 6, such that G is planer and has perfect matching;

Write perfect matching and all maximum matching of G.

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Q1/ Define maximal planner, show that $K_{4,3}$ is maximal planar and sketch the graph

Q2/ Define genus of the graph, if G(p,q) is connected graph of genus ɤ in which every face is triangle then q=3(p-2+2 ɤ), prove.

Q3/ Prove that for any p≥ 3, ɤ(Kp) = $\left\lceil \frac{(p-3)(p-4)}{12} \right\rceil$, where Kp is a complete graph of order p.

Q4/ Find the following and Sketch the graphs:

1- r-factor graph with 5-factorable.
2- Max size of graph G of order p having maximum matching p=2k
3- A graph has perfect matching.
4- Graph has 2-bredge without cut vertex.