计算机学院 2023 年离散期末试题

//说明：本套试题纯手抄，可能会有偏差，特别是附图均为手绘，望理解。同时本试题将开源至 Github，谨防二次倒卖！

1. suppose that A={2,3,6,9,10,12,14,18,20} and R is the partial order relation defined on A where xRy means x is a divisor of y.

a). Draw the Hasse diagram for R.

b). Find all maximal elements.

c). Find all minimal elements.

d). Find lub({3,10}).

e). Find glb({14,10})

2.

(1). Let (G,$*$) be a group and define $f: G \to G$ by $f(a) = a^{-1}$. Is f an isomorphism, justify your answer.

(2). Find all of the normal subgroups of $Z_2 \times Z_3$.

3. Let $H = \begin{vmatrix} 1 & 1 & 0 \\ 1 & 0 & 1 \\ 1 & 1 & 1 \\ 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{vmatrix}$ be a parity check matrix

a). Determine the (3,6) group code $eH: B^3 \to B^6$.

b). Find the minimal distance of eH.

c). How many errors will eH detect?

d). Suppose $x_t = 000111$, compute the syndrome of x_t.

4.

a). When graph G is an undirected graph without self-loops, with |V|=6 and |E|=16, then graph G is an ____ graph.

b). the total degree of the W_8 is _____

c). There is a circuit with a length of _____ in bipartite graphs $K_{3,3}$.

d). There are ____ connected components in the above graph.

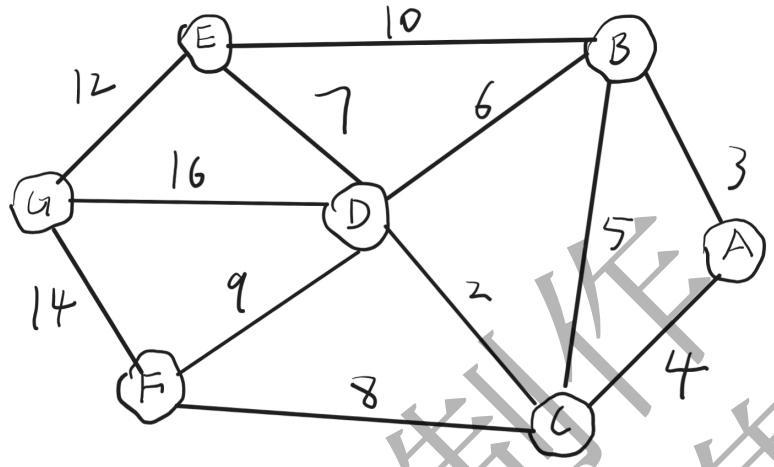
e). It is known that an undirected graph G contains 16 edges, with 3 vertices having a degree of 4 and 4 vertices having a degree of 3. The degree of all other vertices are less then 3. The number of vertices contained in Figure G is at least _____

5.

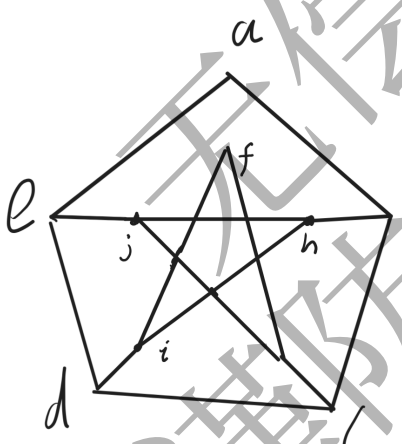
a). Draw an Euler diagram with odd edges and even vertices.

b). Does the graph have a Hamilton circuit? If so, find such a path. If not, give an argument to show why no such path exists.

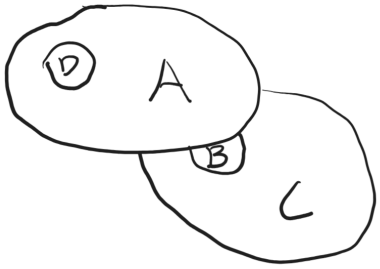
6. Use Dijkstra's Algorithm to find the shortest path length between the vertices A and G in this weighted graph (show process).



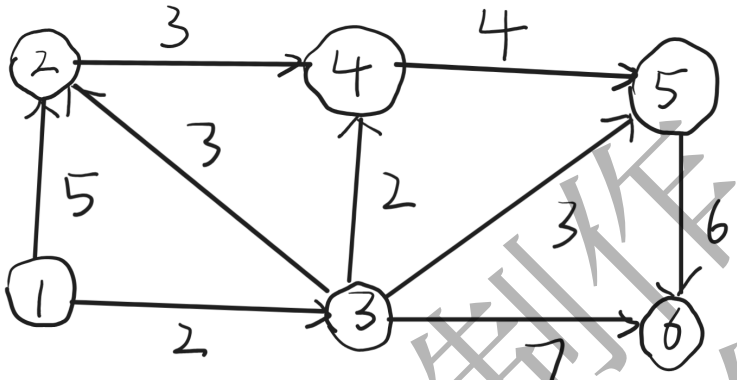
7. Use Kuratowski's Theorem to determine whether the given graph is planar.



8. Construct the dual graph for the map shown : Each region of the map is represented by a vertex, Edges connect two vertices if the regions represented by these vertices have a common border. Then find the chromatic polynomial P_G for the map shown and use P_G to find $x_{(G)}$.



9. Find the maximal flow for the network N given in following figure. And find a minimun cut of this network (Draw the initial situation labeled situation of each flow)



10. Find the solution to the recurrence relation $a_n = 6a_{n-1} - 12a_{n-2} + 8a_{n-3}$ for $n \geq 3$ with initial conditions $a_0 = 1, a_1 = 0, a_2 = 2$.

11. Use generating functions to solve the recurrence relation $a_k = 3a_{k-1} + 4^{k-1}, k \geq 0$,with the initial condition $a_0 = 2$.

12. Use Prime's algorithm to design a minimum cost communications network connecting all the computers represented by the graph in the next figure.