

Partial exam 5 for Discrete Mathematics SF1610, for CINTE1, TCOMK, vt 2021

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Writing time: 13:15 -14:15 (+15 min for uploading. The uploading time opens at 13:45 and closes at 14:30)

Extra writing time (funka): 13:15 -14:45 (+15 min for uploading: The uploading time (Extra time) opens at 13:45 and closes at 15:00)

Use pen and paper to solve the exercises below. Scan or take a picture of the solutions, and upload the file (preferably PDF) on CANVAS/Assignments/KS5. **Please upload a separate file for each exercise** (Do not compress the files).

To approve the exam, you must obtain at least 5 out of 9 points. **Complete solutions are required for every exercise.** (Answers **without** a complete justification are awarded **0 points**).

Write your name and personal number **in every page**. Declare that you have solved the exam by yourself: Write on the first submitted page "*I guarantee that I have done the exam myself*" and sign.

The parameters p and q in the information below, are the last two digits of your personal number (For example, if your personal number is 751331 2248, then $p=4$ and $q=8$). Replace p and q with these numbers and solve the exercises.

1. (3p)

- a) How many edges does the complete bipartite graph $K_{m,n}$ have, where $m=p+2$ and $n=12-p$?
- b) A graph (simple graph or multigraph) G has $(p+4)$ nodes with degree 2, 4 nodes with degree 3 and 5 nodes with degree 4. How many edges does G have?
- c) A connected planar graph H (without loops) has $p+10$ nodes and $p+15$ edges. Determine the number of facets in H .

2. (3p) Let $n = 4 + (q \bmod 3)$. Let G be the complete bipartite graph $K_{2,n}$

- a) Draw the graph G .
- b) Draw G , if possible, as a planar graph, so that the edges do not intersect.
- c) Determine if G has an eulerian trail and justify the answer. (0 points for correct answer without justification.)

3) (3p) Let G be a planar connected graph without loops, and with at least one cycle. Assume further that each cycle in G has at least $15-q$ edges. Prove the inequality $(13-q)e \leq (15-q)v - 30 + 2q$.

Good luck!