

4 Project – submit your solution to petr.kovar@vsb.cz .

If you speak Czech, please submit the project to odevzdávárna ag3c5yi.

Combinatorics

- 4.1. Volkswagen authorized car dealing company prepared for it's customers special offers. These offers have form of 9 lists, each consisting of 12 items selected from high standard accessories as for instance: park assistant, bi-xenon headlights, discover navigation, etc. Twenty items all together. Customer may choose one from among 9 lists and add it's 12 items for free to his preferred choice of Volkswagen car model. Is it possible that any four-tuple of items arbitrarily selected from high standard accessories is included in some of the nine lists offered? Work out your answer carefully, support it by a computation. (2 b)
- 4.2. In garden center, one can buy small bags of seeds of flower called Nasturium flowering in bright orange, yellow, or red brindle flowers. Each bag of seeds marked as "mix of colors" contains 8 peaces (beads), colors of which can't be recognized. In all seeds production, there is $1/2$ seeds of plants with orange flowers, $1/3$ seeds of plants with yellow flowers, and $1/6$ seeds of plants with red brindle flowers. Suppose the seeds are placed into each bag randomly. What is then the probability that from a bag of eight seeds we will grow 3 plants with orange flowers, 3 plants with yellow flowers, and 2 plants with red brindle flowers? (3 b)

Graph Theory

- 4.3. What is the vertex-connectivity and the edge-connectivity of the Circulant $C_8(1,4)$? Prove your statement. Find out at least how many edges is necessary to add to $C_8(1,4)$, so that the resulting graph is edge 4-connected.
- (Let's have positive integers a_1, a_2, \dots, a_k . By a *Circulant* $C_n(a_1, a_2, \dots, a_k)$ we understand a graph $G(V, E)$ with n vertices v_0, v_1, \dots, v_{n-1} , where the edge set is $E = \{v_i v_{(i+a_j) \bmod n} : 0 \leq i \leq n-1 \wedge 1 \leq j \leq k\}$.) (2 b)
- 4.4. State what is it a Hamiltonian graph.
- Further, suppose that G is a graph with the degree sequence $(8, 3, 3, 2, 2, 2, 2, 2)$. Is G Hamiltonian? Prove your statement.
- Hint:* Consider to remove the vertex with highest degree. (3 b)

Guidelines

Write the project using a computer, include the title with your name, student ID, number of the project, year and a grading table (see the sample project). The project will contain a detailed description of your solution for each problem. If you skip a problem, mark it clearly in the text by saying „*I did not solve the problem number X*“.

Submit your project to petr.kovar@vsb.cz as an uncompressed PDF file, use your student ID in the name of your submitted file.

You will be awarded 0 upto 2 or 0 upto 3 points for each of the problems.

Submit your project no later than on **Monday 7.12.2015 at 23:59**.