

QUESTIONNAIRE FOR STUDENTS

Name: _____

Do you speak English fluently? _____

What programming languages do you know? _____

What is your background (i.e., what and where did you study for your bachelor / specialist degree)?

PRELIMINARY (WITHDRAWAL) TEST

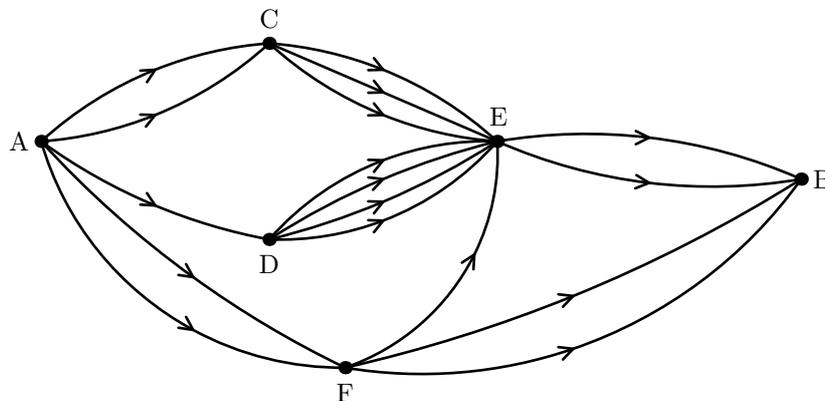
1.a. Rewrite the following formula in Conjunctive Normal Form: $((r \rightarrow q) \rightarrow p) \rightarrow q$

1.b. Construct a propositional formula A , such that $(p \rightarrow A) \equiv (q \rightarrow (\neg p \vee r))$ and $((r \rightarrow q) \rightarrow p) \equiv (\neg p \rightarrow \neg A)$.

2.a. Construct a first-order theory (set of closed formulae) in the signature $\{=^2\}$, that is true in all infinite interpretations and false in all finite ones.

2.b. Let T_1 and T_2 be first-order theories, and let $T_1 \cup T_2$ be an inconsistent theory. Prove that in this case there exists such a formula A , that $T_1 \vdash A$ and $T_2 \vdash \neg A$.

3.a. Count the number of ways to get from A to B on the following roadmap:



3.b. Seven schoolchildren were playing a chess tournament in one round (each plays one game with each). Before the lunch break Ivan played 6 games, Anatoly played 5 games, Alex and Dmitry played 3 games each, Simon and Ilya played 2 games each, and Eugene played only one game. Whom did Alex play with before the lunch break?

4.a. Describe the set defined by the following regular expression: $a(a+b)^*a$, and construct a deterministic finite automaton for this language.

4.b. Describe the language defined by the following context-free grammar: $S \rightarrow SF, S \rightarrow FF, F \rightarrow aFb, F \rightarrow c$.

4.c. Construct a context-free grammar for the following language: $\{a^k b^{k+m} a^m \mid k, m \in \mathbb{N}\}$.

5. Write a program in Python that asks the user for a string and answers whether it is a palindrome. (A *palindrome* is a string that reads the same forwards and backwards.)

Hint: a string in Python is a list.