DISCRETE MATHEMATICS 2nd MIDTERM EXAM

90 minutes   May 7, 2014

Id	Fullname	Signature		Q1	Q2	Q3	Q4	Q5	Q6	Total
				/20	/15	/15	/15	/15	/20	/100

No questions are allowed. Answer the questions to the best of your understanding. If you need to make extra assumptions, state them clearly. Make sure that all your answers are sufficiently (and mathematically) explained.

1. The relation α is *cyclic* if it satisfies this property: $a\alpha b \wedge b\alpha c \Rightarrow c\alpha a$.
   Prove that if a relation is cyclic and symmetric then it is an equivalence relation.

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ANYTHING WRITTEN BELOW THIS LINE WILL NOT BE GRADED.

2. Let $f : A \to B$ where $|A| = m$ and $|B| = n$. What should be the relationship between m and n for f to be

   (a) injective?

   (b) surjective?

   (c) bijective?

3. In an exam with 30 students, 1 student has made 13 mistakes and all other students have made fewer mistakes. Prove that at least 3 students have made the same number of mistakes.

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4. Draw all non-isomorphic plain graphs on 5 vertices and exactly 3 edges.

5. For what values of n

    (a) does K_n have an Euler path?

    (b) does K_n have a Hamiltonian path?

6. Consider the expression:

$$\frac{1}{\sqrt{2\pi}} e^{-\frac{x^2}{2}}$$

(a) Draw the expression tree for this expression. Use the ↑ symbol for exponentiation and represent $\sqrt{a}$ as $a \uparrow 0.5$.

(b) Write the postorder traversal for this expression tree.

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