ITP 20002-03 Discrete Mathematics, 2021 Fall

Test #3

November 19, 2021

You are given five problems with total 100 points to be solved in 75 minutes.

Write an answer of each of the following questions on the corresponding answer box in the answer sheet.

1. What is the probability that a randomly generated bitstring whose length is no more than 8 is palindrome? (15 points)

2. Prove the following statement (20 points):

$$\sum_{k=0}^{r} C(n+k,k) = C(n+r+1,r)$$

3. How many solutions are there to the equation

$$min \leq \sum_{i=1}^{n} x_i \leq max$$

where x_i is a non-negative integer.

Your answer must be a formula using n, min and max without Σ (20 points)

4. Show that if you choose n+1 integers from [1, $2n$], there exist two chosen numbers such that one divides the other one (20 points).

5. Prove the generalized Bayes' theorem (25 points)

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