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| COMP 2121 **DISCRETE MATHEMATICS** | Assignment 1  Fall 2024 |

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| Name: ???? A0???? | Set: 2? | |
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| Section | Total | Actual |
| Question 1 | 40 |  |
| Question 2 | 15 |  |
| Question 3 | 10 |  |
| Question 4 | 10 |  |
| Question 5 | 10 |  |
| Total | 85 |  |

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| C:\Users\A00141222\AppData\Local\Microsoft\Windows\Temporary Internet Files\Content.IE5\ARBZC6KC\MC900432530[1].png | | | Instructions |
|  |  |  | * Assignment must be done using Microsoft Word or an alternative word processor – **type** your work in this document. * Handwritten assignments will not be marked. * The header of every page has math templates and logic symbols that are needed. You can copy them into your text |
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|  |  |  | * The assignment must be done in a **group** of two students – no individual assignments will be accepted. |
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|  |  |  | * Just the answer will not give you credit for a problem. * When you solve a problem, you must provide necessary **explanations** – yes this means explanations in English. Normally one paragraph is sufficient, but it may take more depending on a question. |
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|  |  |  | * Do not evaluate final answer unless the question asks you to do that. Leave it as a **formula**, following the format in lectures and labs. |
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|  |  |  | * **PRINT** the completed assignment – you are handing in a paper copy. |
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|  |  |  | * **Due** at the beginning of the **Lecture** on **October 2, 2024**. * No late assignments will be accepted. * Electronic copies will not be accepted. |
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**Q1)** The System Administrator has set the following rules for the password:

* The password is a string made of 14 characters.
* The available characters are Hexadecimal digits 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, A, B, C, D, E, and F.
* Repetition is allowed unless otherwise stated.

\*\*\* Do not evaluate expressions \*\*\*

1. How many passwords have exactly seven A’s and at least five B’s?

Explanation:

Answer:

1. How many passwords have exactly two A’s and exactly three B’s, so that the three B’s are sandwiched between the A’s? 010**A**1 **B**8**BB** 3112**A** is an example of such a string.

Explanation:

Answer:

1. How many passwords have at least one A, at least one B, at least C, and have no other characters?

Explanation:

Answer:

1. How many passwords with exactly 3 B’s, have the sum of all digits equal to 40 and have no adjacent B’s? Examples of such passwords are 00230 **B**11**B** 000**B**0, **B**1101 0**B**00 00**B**04, etc.

Explanation:

Answer:

**Q2)** Consider the following programming segment. Your answer must rely on a combination structure. Answers that use sigma notation will not be accepted.

counter = 100

for i = 4 to (n+3) do {

counter = counter + 11

for j = i+1 to (3n+15) do {

counter = counter + 22

for k = j+1 to (n+8) do {

counter = counter + 33

}

}

}

// assume n ≥ 10

**a)** Determine the value of the variable counter after the segment is executed. Provide your answer as a function of n (i.e., a formula which depends on n). Make sure to explain how/why the parts of the formula relate to counting.

Explanation:

Answer:

**b)** Evaluate your answer in part a) for n = 50. Show the work

**c)** Check your answer in part b) by implementing the code in a programming language of your choice. Use the value n = 50 and print the variable counter after the code execution. You must provide two screenshots: implementation and output.

**d)** What do you conclude?

**Q3)** Use the truth table to show that the following argument is NOT valid.

Clearly, **1) indicate in red/bold in the table** what makes you come to that conclusion, and then **2) explain your answer below the table**

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| --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |
| 0 | 0 | 0 |  |  |  |
| 0 | 0 | 1 |  |  |  |
| 0 | 1 | 0 |  |  |  |
|  |  |  |  |  |  |
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**Explanation:**

**Q4)** Use rules of inference and direct proof to prove the argument is valid.

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| STEPS | | REASON |
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| 2 |  |  |
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| 4 |  |  |
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**Q5)** Use rules of inference and proof by contradiction to prove the argument is valid.

Note: contradiction pointing to and will not be accepted. In other words, if you start with , then independently prove x (which is Q4), and say lines and are in contradiction – proof will not be accepted. Instead, follow instructions from the lecture/lab.

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| STEPS | | REASON |
| 1 |  |  |
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| 3 |  |  |
| 4 |  |  |
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