



**UJIAN TENGAH SEMESTER
SEMESTER GASAL 2015/2016**

Program Sarjana - Jurusan Sistem Informasi
Fakultas Teknologi Informasi
Institut Teknologi Sepuluh Nopember
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MATAKULIAH : Matematika Diskrit	KELAS : A, B, C, D
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Durasi Waktu Pelaksanaan : 120 Menit	Hari/Tanggal : 28 Oktober 2016

1. When three professors are seated in a restaurant, the hostess asks them: “Does everyone want coffee?” The first professor says: “I do not know.” The second professor then says: “I do not know.” Finally, the third professor says: “No, not everyone wants coffee.” The hostess comes back and gives coffee to the professors who want it. How did she figure out who wanted coffee?
2. Show that $p \leftrightarrow q$ is logically equivalent with $\neg p \leftrightarrow \neg q$ by using the Equivalence Laws.
3. Translate each of these statements into logical expressions using predicates, quantifiers, and logical connectives.
 - a. No one is perfect.
 - b. Not everyone is perfect.
 - c. All your friends are perfect.
 - d. At least one of your friends is perfect.
4. Determine the truth value of each of these statements if the domain for all variables consists of all integers.
 - a. $\exists n \forall m (n < m^2)$
 - b. $\exists n \exists m (n + m = 4 \wedge n - m = 1)$
 - c. $\forall n \exists m (n + m = 0)$
 - d. $\forall n \forall m \exists p (p = (m + n)/2)$
5. In the back of an old cupboard you discover a note signed by a pirate famous for his bizarre sense of humor and love of logical puzzles. In the note he wrote that he had hidden treasure somewhere on the property. He listed five true statements (a - e below) and challenged the reader to use them to figure out the location of the treasure.
 - a. If the house is next to a lake, then the treasure is not in the kitchen
 - b. If the tree in the front yard is an elm, then the treasure is in the kitchen
 - c. This house is next to a lake
 - d. The tree in the front yard is an elm or the treasure is buried under the flagpole
 - e. If the tree in the back yard is an oak then the treasure is in the garageWhere is the treasure hidden? (Hint: use Rules of Inference)
5. Prove that if x and y are real numbers, then $\max(x, y) + \min(x, y) = x + y$. (Hint: Use a proof by cases, with the two cases corresponding to $x \geq y$ and $x < y$, respectively).
6. Find the symmetric difference of the set of computer science majors at a school and the set of mathematics majors at this school.
7. Proof the following theorem : For integers a and b , if ab is even then a is even or b is even.