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Quiz 1 of 4 – Practice Version**Student Number**

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**Student Name**

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*This is a closed book exam. No calculators, cellphones, laptops, or other aids are permitted. Answer all questions in the space provided. Show all your work - correct answers presented without justification may receive a mark of zero.*

1. Complete the truth table for the following logical expression. Be sure to include a column for each subexpression you evaluate. [6 marks]

$$p \oplus ((\neg p \vee \neg q) \rightarrow p)$$

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2. Determine whether the following expression is a tautology, a contingency, or a contradiction by using the logical equivalences. You will not receive marks for a truth table but you may use one to verify your answer if you wish. You must state the logical equivalence used with each step, but because of space restrictions you may omit applications of the commutative or associative equivalences. [7 marks]

$$(\neg(\neg(p \wedge p) \wedge p)) \wedge ((q \vee q) \wedge \neg q)$$

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3. Let the universe of discourse be all animals. Translate the following statements into predicate logic expressions (and don't forget to specify what variables you are using for each predicate). [3 marks]

a. At least one camel cannot jump.

b. Every cheetah can sleep.

4. Determine if the following logical and arithmetic statement is true or false and justify your answer. [3 marks]

if  $14 < 5$  or  $(15 - 13) < 11$  then  $5 > 11$  or  $5 > 14$

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5. State the inverse, converse, and contrapositive of the following implication expression as an English sentence. Ensure that you simplify your expressions before translating. [6 marks]

If it is financial then it is not impossible or it is not difficult.