

Quiz 1

*Instructor: Fatima Abu Salem***Name:****Duration: 1 hour****This exam is closed notes.****Question 1 (24%)**

Determine the implication per each of the following statements below. Express the implication using (i) propositional variables and connectives and (ii) plain English.

- (a) It is necessary to exercise regularly in order to lose weight.
- (b) A sufficient criterion for you to get a ticket refund is that you have paid for the ticket by cash money.
- (c) I travel to Europe whenever the weather permits.
- (d) I will attend your party unless I am too busy.

Question 2 (10%)

Show that

$$((p \leftrightarrow q) \wedge (p \rightarrow r)) \vee (\neg p \rightarrow (q \wedge r))$$

is not a tautology, using symbolic derivation. Justify your answer at each step.

Question 3 (20%)

Translate the following statement into logical expressions in **three** different ways by varying the domain and by using predicates with one and with two variables:

“No mother enjoys waking up early on a Sunday.”

Question 4 (15%)

Use quantifiers, predicates, and logical connectives, to express the following statement;

“For every course you need there is at least one semester per year when this course is given if and only if there is an instructor to teach this course.”

Question 5 (15%)

Determine the truth value of each of these statements if the domain for all variables consists of all integers.

(a) $\exists n \exists m (2x + 5y = y \wedge x + 5y = 3)$.

(b) $\forall x \forall y \exists z (z = \frac{x+y}{3})$

Question 6 (16%)

(a) Prove that there exists a positive integer that equals the product of the positive (non-zero) integers not exceeding it.

(b) Show that $2x$ is irrational if and only if $x - 5$ is irrational if and only if $x/3$ is irrational.

Answer Sheet 1

Answer Sheet 2

Answer Sheet 3

Answer Sheet 4

Answer Sheet 5

Answer Sheet 6

Answer Sheet 7

Answer Sheet 8

Answer Sheet 9

Answer Sheet 10