

**Quiz #1**

Maximum Marks: 20, Maximum Time: 20 mins

**Date : 01/09/2024****MTH210: Discrete Structures****Name:** \_\_\_\_\_**Semester: Monsoon 2024****Tutorial Section:** \_\_\_\_\_

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**Problem 1.** [7+1+2] Consider the following hypotheses (H1, H2, H3) and conclusion (C).

- (H1) If Puneet Superstar insults Deepak Kalal, then Deepak will make a reaction video.
  - (H2) If Deepak Kalal makes a reaction video, then Puneet Superstar will post a response on Instagram.
  - (H3) Puneet Superstar did not post a response on Instagram.
  - (C) Deepak Kalal did not make a reaction video.
- (a) Define three simple statements  $p$ ,  $q$ , and  $r$  and write H1, H2, H3, and C as logical statements in terms of  $p$ ,  $q$ , and  $r$ .
- (b) Write the logical statement which you will check if it is a tautology or not to determine the validity of the argument.
- (c) Is the argument valid? Give your reason.

**Problem 2.** [5] A function  $f$  defined on real numbers is said to be continuous at  $x_0$  if the proposition

$$p : (\forall \varepsilon > 0) (\exists \delta > 0) (\forall x) [(|x - x_0| < \delta) \rightarrow (|f(x) - f(x_0)| < \varepsilon)]$$

is true. Write a proposition to define that  $f$  is discontinuous (not continuous) at  $x_0$ . (Hint. Write  $\neg p$ .)

**Problem 3.** [5] Prove using proof by contrapositive that if  $a^2 + b^2$  is irrational then at least one of  $a$  or  $b$  is irrational.