Master of Computer Application (MCA)

MCAC-102: Discrete Mathematics

Semester: I

Feb 2022

Year of admission: 2021

Time: 1.5 Hours **Max. Marks: 30**

Instructions for the Students:

Attempt all questions.

1. a. Determine that the given expression $[(p \wedge q) \wedge (p \vee \sim r)] \leftrightarrow p$ is tautology/ contradiction/ contingency. 2.5

   b. Draw the HASSE diagram and determine whether the POSETs ({1,2,3,4,6,8,12,24},|) and ({1,3,9,27,81,243},|) are lattices. Justify the answer. 5

2. a. Negate the following statement $\forall x \exists y \exists z(\sim P(x,y) \wedge Q(y,z))$ 2.5

   b. Let $Q(x,y)$ denotes"$x + 2y = 5$". 5

   Is it true i) $\forall x \exists y(Q(x,y))$ ii) $\forall x \exists y \exists z(Q(x,y))$. Justify?

   Assume that the domain is set of all positive integers.

3. a. State which rule of inferences is used in the arguments. (Hypothesizes are given) 5

$$p \wedge q$$
$$r \leftrightarrow s$$
$$s \rightarrow p$$
$$w \rightarrow (r \wedge \sim s)$$
$$\sim p$$

   Argue that conclusion $\sim w$ is valid/true.

   b. Given a function $f: r \rightarrow r$ where $f(x) = 2 * x + 3$. Does it a injective and surjective if yes justify your answer otherwise give your argument. 4

   c. Obtain the principal conjunctive normal form and Principal disjunctive normal form for the following statement $p \vee (\sim p \rightarrow (\sim q \rightarrow r))$ 6