B.Tech
3rd Semester (*Regular*)
SAS-2022

AUTUMN MID SEMETER EXAMINATION-2022

Subject: Discrete Mathematics

Code: MA-2013

Full Marks: 20 **Time: 1.5 Hrs**

Answer any FOUR QUESTIONS including question No. 1 which is compulsory. The figures in the margin indicate full marks.
Candidates are required to give their answers in their own words as far as practicable and all <u>parts of a question should be answered at one place only</u>

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1. Answer the following questions [5×1=5]

(a) Suppose x is a particular real number and p, q, r are the statements "$1 = x$", "$x < 1$", "$x < 5$" respectively. Write the inequality $1 \leq x < 5$ by using propositional logic.

(b) Write the negation of the conditional statement "if 30 is less than 100 then 30 less than 200."

(c) Write the contrapositive of the conditional statement "An integer is divisible by 5 only if it is divisible by 15" in the form of "if…then…"

(d) Test whether the argument "If it rains, the prices of vegetables go up", "The prices of vegetables go up", therefore "It rains" is valid.

(e) Let $P(x)$: x is an odd integer and $Q(x)$: x is a prime integer. Write the statement $\exists(P(x) \wedge Q(x))$ in a English.

2. (a) Determine whether the statements $p \wedge (q \vee r)$ and $(p \wedge q) \vee (p \wedge r)$ are logically equivalent. [2.5]

(b) Determine whether these system specifications are consistent: [2.5]

"The diagnostic message is stored in the buffer or it is retransmitted." "The diagnostic message is not stored in the buffer." "If the diagnostic message is stored in the buffer, then it is retransmitted."

3. (a) Use truth table to determine whether the following argument form is valid. [2.5]

$$\begin{array}{l} \neg p \vee q \\ r \rightarrow \neg q \\ \therefore p \rightarrow \neg r \end{array}$$

(b) Write the proposition "There is no integer n such that n^2 is 5" using predicate and quantifier. [2.5]

4. Use rules of inference to determine whether the following argument form is valid. [5]

$$\begin{array}{l} \neg p \vee q \rightarrow r \\ s \vee \neg q \\ \neg t \\ p \rightarrow t \\ \neg p \wedge r \rightarrow \neg s \\ \therefore \neg q \end{array}$$

5. What is principle of strong induction? Use strong induction to show that every positive integer can be written as a sum of distinct powers of two. [5]

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