VEER SURENDRA SAI UNIVERSITY OF TECHNOLOGY (VSSUT), ODISHA

Even Mid Semester Examination for session 2025-26

COURSE NAME:B. Tech SEMESTER: 4st

BRANCH NAME:IT & CSE

SUBJECT NAME: Discrete Mathematics

FULL MARKS: **30** TIME: **90 Minutes**

Answer **All** Questions.

The figures in the right-hand margin indicate Marks. *Symbols carry usual meaning.*

Q1. Answer all Questions. **[2 × 3]**

a) If p: Mohan is healthy, q: Mohan will go to school, then what is the contrapositive the statement$p \rightarrow q$? - CO1

b) Define predicate with an example. - CO2

c) What is transitive closure relation? - CO3

Q2. **[4+4]**

a) Find the conclusion of the following argument: - CO1

$(\sim(p \wedge \sim q)) \wedge (\sim q \vee r) \wedge (\sim r)$.

b) (i) State Pigeonhole principle. - CO1

(ii) How many students must be in a class to guarantee that at least two students receive the same score on the final exam is graded on a scale from 0 to 100 points?

OR

c) Use induction to prove $10^{n+1}+10^n+1$ is divisible by 3. - CO1

d) (i) Find the number of diagonal on an octagon. - CO1
(ii) Nabita has 9 friends. In how many ways she can invite her friends in her birthday party so that at least two will come.

Q3. **[4+4]**

a) Define tautology. Is $(p \wedge q) \rightarrow r$ and $(p \rightarrow r) \wedge (q \rightarrow r)$ are logically equivalent? Justify your answer. - CO2

b) Define quantifier and type of quantifier. What is the truth value of $\sim\exists x p(x)$, where $p(x)$ is the statement $x + 10 > 6$ such that$x < -4$. - CO2

OR

c) If $1 \leq r \leq n$, then prove that $C(n,r) + C(n,\ r-1) = C(n+1,r)$. - CO2

d) Using mathematical induction show that$1^2 + 2^2 + 3^2 + \cdots + n^2 = \frac{n(n+1)(2n+1)}{6}$. - CO2

Q4. **[8]**

a) State equivalent relation and explain the properties of equivalent relation. Let us assume that R is a relation on the set of integers defined by aRb if and only if $a - b$ is an integer. Prove that R is an equivalent relation. - CO3

OR

b) Define relation and type of relation with an example. Explain partial order relation with example. - CO3

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