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Code No: F-13649/N/AICTI

FACULTY OF ENGINEERING

B.E. (CSE) III–Semester (AICTE) (New) (Main & Backlog) Examinations, February / March 2024

Subject: Discrete Mathematics

Time: 3 Hours **Max. Marks: 70**

Note: (i) First question is compulsory and answer any four questions from the remaining six questions. Each question carries 14 Marks.
(ii) Answer to each question must be written at one place only and in the same order as they occur in the question paper.
(iii) Missing data, if any, may be suitably assumed.

1. (a) $(P \wedge (P \to Q)) \to Q$ is equivalent to tautology $\Leftarrow P \wedge (P \to Q)$ $P \vee (\neg P \vee Q)$
(b) Given $h(x) = 5-9x$, find $h^{-1}(x)$. $\Rightarrow$ (b) $y = h(x) = 5-9x$ replace x with y and y with x
$x = 5 - 9y$
$y = \frac{5-x}{9}$
$h^{-1}(x) = y = \frac{5-x}{9}$
(c) Find the non-negative integral solution to $x_1+x_2+x_3=10$, where $x_i>=0$.
(d) Find the sequence for the $\sum_{i=0}^{\infty}(ax)^i$ generating function.
(e) What is a commutative Ring? Give an example.
(f) Find chromatic number for a bipartite graph.
(g) Differentiate a Spanning tree from Sub graph.

(c) $\sum_{i=0}^{\infty}(ax)^i = (ax)^0 + (ax)^1 + (ax)^2 + (ax)^3 + \ldots$
$= 1 + ax + (ax)^2 + (ax)^3 + \ldots$
$= (1-ax)^{-1}$
$\sum_{i=0}^{\infty}(ax)^i = \frac{1}{1-ax}$.

2. (a) Show that the conclusion follows logically from the given set of premises.
P1: $(\exists x)\,(F(x) \cap S(x)) \to (\forall y)(M(y) \to W(y))$
P2: $(\exists y)\,(M(y) \cap \neg W(y))$
The conclusion is $(\forall x)\,(F(x) \to \neg S(x))$.
(b) Show the validity of the statement
$\forall x,(P(x) \to Q(x))$ is logically equivalent to $\forall x(\neg Q(x) \to \neg P(x))$.

3. (a) Show the correctness of the statement using an example
There are n^m functions from a set with m elements to a set with n elements.
(b) Consider A = {1, 2, 3, 5, 6, 10, 15, 30} and let R be the relation ≤ on A. Draw a Hasse diagram of R.

4. (a) Compute the coefficient of x^{15} in $x^8/(1-x)^2$
(b) How many 3 letter words with or without meaning can be formed out of the letters of the word SMOKE when repetition of words is allowed?

5. (a) Solve the recurrence relation
$a_n - 5a_{n-1} + 6a_{n-2} = 0$ for $n \geq 2$, $a_0=10$ and $a_1=20$
(b) Consider the recurrence relation $a_1=4$, $a_n=5n+a_{n-1}$. The value of a_{64} is _

$(P \wedge (P \to Q)) \to Q$
$[P \wedge (\neg P \vee Q)] \to Q$
$[\neg P \vee (P \wedge Q)] \vee Q$
$[(\neg P \vee P) \wedge (\neg P \vee Q)] \vee Q$
$(P \vee Q) \wedge (\neg P \vee Q)$