Sub Code: R2321051 **R23** **Set No. 1**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY- GURAJADA VIZIANAGARAM
II B. Tech I Semester Regular Examinations, November – 2024
Mathematical Foundations of Computer Science
(CSE)

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

Question paper consists of Part A, Part B.
Part A is compulsory, Answer all questions.
In Part B, Answer any one question from each unit.

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PART-A **(20 Marks)**

1	a)	Show that $P \vee (P \wedge Q) \Leftrightarrow P$	[2]
	b)	Symbolize the expression "All men are giants"	[2]
	c)	Define Partially ordered set.	[2]
	d)	Let X = {2,3,6,12,24,36} and the relation ≤ be such that x ≤ y if x divides y. Draw the Hasse diagram of $\langle X, \leq\rangle$	[2]
	e)	State the Lagrange's theorem.	[2]
	f)	State division theorem.	[2]
	g)	Define a recurrence relation and give one example it.	[2]
	h)	How to calculate the coefficient of generating functions.	[2]
	i)	Define a Tree.	[2]
	j)	Define spanning tree.	[2]

PART-B **(50 Marks)**

Unit-1

2	a)	Show that $(\neg P \wedge (\neg Q \wedge R) \vee (Q \wedge R) \vee (P \wedge R) \Leftrightarrow R$.	[5]
	b)	Obtain disjunctive normal form of $P \wedge (P \longrightarrow Q)$.	[5]
		(OR)	
3	a)	Show that the formula $Q \vee (P \wedge \neg Q) \vee (\neg P \wedge \neg Q)$ is a tautology	[5]
	b)	Show that $S \vee R$ is tautologically implied by $(P \vee Q) \wedge (P \to R) \wedge (Q \to S)$	[5]

Unit-2

4	a)	Show that the function $f\langle x1, x2, y\rangle$ defined as $$f\langle x1, x2, y\rangle = \begin{cases} x2 & x1 > y \\ (x1 * y) + x2 & x1 \leq y \end{cases}$$ is primitive recursive.	[5]
	b)	Let S = {a, b, c}. Draw the diagram of $\langle \rho(S), \subseteq\rangle$	[5]
		(OR)	
5	a)	Show that in a lattice if $a \leq b$ and $c \leq d$ then a*$c \leq b * d$	[5]
	b)	Show that the function $f\langle x, y\rangle = x + y$ and $g\langle x, y\rangle = xy$ are onto but not one-to-one.	[5]

Unit-3

6	a)	If G is a group such that $(a.b)^2 = a^2.b^2$ for all $a, b \in G$, then show that G must be abelian group.	[5]
	b)	If p is a prime and if a is any integer such that p does not divide a, then show that $a^{p-1} \equiv 1\ (mod\ n)$	[5]
		(OR)	
7	a)	If G is a finite group and $a \in G$ then show that $a^{o(G)} = e$	[5]
	b)	If $(a, n) = 1$ then show that $a^{\varphi(n)} \equiv 1\ (mod\ n)$	[5]

Unit-4

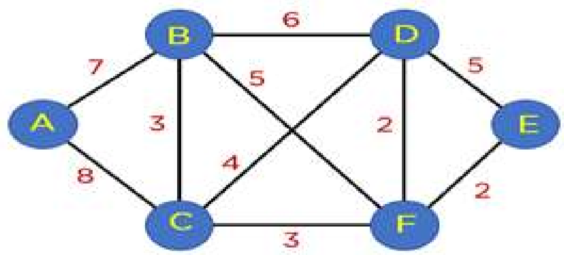
8		Solve the difference equation: $a_n = a_{n-1} + n^2$, $a_0 = 0$	[10]

(OR)

9 Given $a_0 = 0$, $a_1 = 1$, and $3a_n - 10a_{n-1} + 3a_{n-2} = 3n$ for $n \geq 2$, Solve the equation [10]

Unit-5

10 a) Find the minimum spanning tree of the graph using Prim's *algorithm* [5]

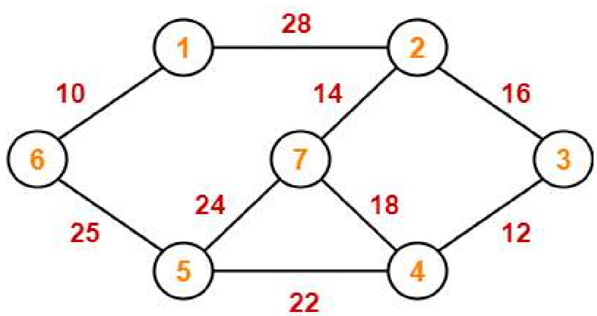


b) Define: (i) Euler Graph; (ii) Hamiltonian Graph (iii) Tree (iv) Spanning tree [5]

(OR)

11 a) Show that the number of odd degree vertices of any finite graph is always even [5]

b) Find the minimum spanning tree of the graph by using Kruskal's Algorithm [5]



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