Q.P. Code: 16CS507 **R16**

Reg. No: | | | | | | | | | | |

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY: PUTTUR

(AUTONOMOUS)

B.Tech II Year I Semester Supplementary Examinations June 2019

MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE

(Common to CSE & CSIT)

Time: 3 hours Max. Marks: 60

Answer all Five Units **5 x 12 = 60** Marks

UNIT-I

1	**a**	Prove that $P \vee Q \Leftrightarrow \neg\left(\neg P \wedge \neg Q\right)$	5 M
	b	Prove that $(\exists x)\left(P(x) \wedge Q(x)\right) \Rightarrow (\exists x)\, P(x) \,\wedge\, (\exists x)\, Q(x)$	7 M

OR

2	**a**	Using algebra of propositions, show that $P \Leftrightarrow Q \equiv \left(P \vee Q\right) \Rightarrow P \wedge Q$	7 M
	b	Obtain DNF and CNF for $\neg\left(\neg\left(P \;\square\; Q\right) \wedge R\right)$	5 M

UNIT-II

3	**a**	Let $f : X \to Y$ be an everywhere defined invertible function A and B be arbitrary non-empty subsets of Y. Show that (i) $f^{-1}\left(A \cup B\right) = f^{-1}\left(A\right) \cup f^{-1}\left(B\right)$ (ii) $f^{-1}\left(A \cap B\right) = f^{-1}\left(A\right) \cap f^{-1}\left(B\right)$	6 M
	b	Define and give an example for group, semigroup, subgroup and abelian group.	6 M

OR

4	**a**	Define primitive recursive function. Show that the function $f\left(X, Y\right) = X + Y$ is primitive recursive.	7 M
	b	On the set Q of all rational numbers with operation * is defined by $\mathrm{a} * \mathrm{b} = \mathrm{a} + \mathrm{b} - \mathrm{ab}$. Show that this operation on Q forms a commutative monoid.	5 M

UNIT-III

5	**a**	Find the integral solutions to $x_1 + x_2 + x_3 + x_4 + x_5 = 20$ where each (i) $x_i \geq 2$ (ii) $x_i > 2$	6 M
	b	Out of 80 students in a class, 60 play football, 53 play hockey, and 35 both the games. How many students (i) do not play of these games. (ii) play only hockey but not foot ball	6 M

OR

6	**a**	How many permutations can be formed out of the letters of word “SUNDAY”. How many of these (i) Begin with S (ii) End with Y (iii) Begin with S and end with Y (iv) S &Y always to gather.	6 M
	b	Obtain the co-efficient of (i) $x^3 y^7$ in $\left(x + y\right)^{10}$ (ii) $x^2 y^4$ in $\left(x - 2y\right)^6$	6 M

UNIT-IV

7	**a**	Solve the recurrence relation by substitution $a_n = a_{n-1} + \dfrac{1}{n\left(n+1\right)}$, where $a_0 = 1$	7 M
	b	Show that $a_n = -2^{n+1}$ is a solution of the linear recurrence relation $a_n = 3a_{n-1} + 2^n$	5 M

OR

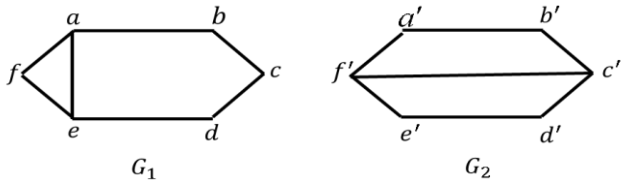
8	**a**	Solve the recurrence relation $a_n = a_{n-1} + 2$, for $n \geq 2$ with initial condition $a_1 = 3$	5 M
	b	Apply the generating function technique to solve the recurrence relation $a_{n+2} + 2a_{n+1} + a_n = 1 + n$	7 M

UNIT-V

9	**a**	Show that the maximum number of edges in a simple graph with n vertices is $\frac{n(n-1)}{2}$.	6 M
	b	Draw the graph represented by given Adjacency matrix (i) $\begin{bmatrix} 1 & 2 & 0 & 1 \\ 2 & 0 & 3 & 0 \\ 0 & 3 & 1 & 1 \\ 1 & 0 & 1 & 0 \end{bmatrix}$ (ii) $\begin{bmatrix} 1 & 0 & 2 & 1 \\ 0 & 1 & 1 & 2 \\ 2 & 1 & 1 & 0 \\ 1 & 2 & 0 & 1 \end{bmatrix}$	6 M

OR

10	**a**	A graph G has 21 edges, 3 vertices of degree4 and the other vertices are of degree 3. Find the number of vertices in G.	6 M
	b	Is the following pairs of graphs are isomorphic or not?	6 M



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