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(FOR THE CANDIDATES ADMITTED
DURING THE ACADEMIC YEAR 2021 ONLY)
REG.NO. :

21UMS6E1

N.G.M.COLLEGE (AUTONOMOUS) : POLLACHI
END-OF-SEMESTER EXAMINATIONS :MAY-2024
COURSE NAME : B.Sc.-MATHEMATICS **MAXIMUM MARKS: 70**
SEMESTER: VI **TIME : 3 HOURS**

PART - III
DISCRETE MATHEMATICS

SECTION - A (10 X 1 = 10 MARKS)

ANSWER THE FOLLOWING QUESTIONS.
MULTIPLE CHOICE QUESTIONS. **(K1)**

1. The value of F_4 of the Fibonacci numbers using recursion is _____.
   (a) 5 (b) 4 (c) 3 (d) 1
2. The value of $p \vee (p \wedge q)$ is _____.
   (a) p (b) q (c) $p \wedge q$ (d) $p \vee q$
3. If for every $a, b \in X$, both $a \vee b$ and $a \wedge b$ exists in a Poset $(X, \leq)$ then the Poset is _____.
   (a) Boolean Algebra (b) Lattice (c) Modular (d) Equivalence relation
4. A graph in which every vertex has same degree is_____.
   (a) Irregular (b) regular (c) multi graph (d) connected graph
5. If $\sum = \{0,1,2\}$ and the string w = 01212 then the length of w is_____.
   (a) 2 (b) 3 (c) 5 (d) 0

ANSWER THE FOLLOWING IN ONE (OR) TWO SENTENCES. **(K2)**

6. Define characteristics equation of the homogeneous equation of order n.
7. Define elementary product.
8. If D(n) denotes the Lattice of all positive divisors of the integer n, draw the Hasse diagram of D(10).
9. Define intersection of two graphs $G_1$and G_2.
10. Define type K- language.

SECTION – B (5 X 4 = 20 MARKS)

ANSWER EITHER (a) OR (b) IN EACH OF THE FOLLOWING QUESTIONS. (K3)

11. a) Find the recurrence relation satisfying $y_n = A(3)^n + B(-4)^n$.

(OR)

b) Find $f(n)$ if $f(n) = 7f(n-1) - 10f(n-2)$ given that $f(0) = 4$ and $(1) = 17$.

12.a) Show that $(P \to Q) \Longrightarrow (\neg Q \to \neg P)$.

(OR)

b) Obtain a disjunctive normal form of $P \to \big((P \to Q) \wedge \neg(\neg Q \vee \neg P)\big)$.

13.a) Let $(L, \leq)$ be a lattice. For any $a, b \in L$. If $a \leq b$ then prove that $a \vee b = b$

(OR)

b) In a Boolean algebra L, prove that $(a \wedge b)' = a' \vee b'$ for all $a, b \in L$.

(CONTD……2)

14.a) Prove that the number of vertices of odd degree in a graph is always even.

(OR)

b) Draw the complete graph $K_6$and also find the number of edges in the graph K_{15} .

15.a) Let $\sum = \{0,1\}$. Show that the following expressions are regular expressions over $\sum = \{0,1\}$
(a) $0^*(0-1)$ (b) $00^*(0+1)^*$ (c) $(01)^*(01+1)^*$.

(OR)

b) Let V = {S, A, B},$\sum = \{a, b\}$ starting symbol S and production
$P = \{S \to aABa, A \to baABb, B \to Aab, aA \to baa, bBb \to abab\}$.
Find the language generated by G = (V, $\{a, b\}$, S, P).

SECTION - C (4 X 10 = 40 MARKS)

ANSWER ANY FOUR OUT OF SIX QUESTIONS
(16th QUESTION IS COMPULSORY AND ANSWER ANY THREE QUESTIONS
(FROM Qn. No : 17 to 21) (K4 (Or) K5)

16. Let L be a complemented, distributive lattice. For $a, b \in L$,
Prove that the following are equivalent.
(i) $a \leq b$
(ii) $a \wedge b' = 0$
(iii) $a' \wedge b = 1$
(iv) $b' \leq a'$

17. Using the generating function solve the difference equation $y_{n+2} - y_{n+1} - 6y_n = 0$ given $y_1 = 1, y_0 = 2$.

18. Show that if $p \to q, q \to r, \neg(p \wedge r)$ and $p \vee r$, then r.

19. In a distributive lattice , prove that the following are equivalent
(i) $a \wedge b \leq x \leq a \vee b$
(ii) $x = (a \wedge x) \vee (b \wedge x) \vee (a \wedge b)$.

20. Prove that a simple graph G with n vertices and k components cannot have more than $\frac{1}{2}(n-k)(n-k+1)$ edges.

21. Design a finite – state machine that performs serial addition.

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ETHICAL PAPER