(FOR THE CANDIDATES ADMITTED **23UCS2A1**

DURING THE ACADEMIC YEAR 2023 ONLY) **REG.NO. :**

N.G.M.COLLEGE (AUTONOMOUS) : POLLACHI

END-OF-SEMESTER EXAMINATIONS : MAY-2024

BSC - COMPUTER SCIENCE(AIDED & SF) **MAXIMUM MARKS: 75**

SEMESTER: II **TIME : 3 HOURS**

PART - III

23UCS2A1 – DISCRETE MATHEMATICS

SECTION – A **(10 X 1 = 10 MARKS)**

ANSWER THE FOLLOWING QUESTIONS. (K1)

CHOOSE THE BEST ANSWER

01. With usual notations, $P \wedge T$ is equal to____________

(a) P (b) ┐P (c) T (d) F

02. A relation is said to be partial order relation if it is ____________

(a) reflexive, symmetric and transitive (b) reflexive, anti-symmetric and transitive

(c) irreflexive, symmetric and transitive (d) irreflexive, anti-symmetric and transitive

03. A function $f : A \to A$ is defined by $f(x) = x$ is called _____ function

(a) one – one (b) onto (c) identity (d) many to one

04. The set of idempotent elements of a commutative monoid (M, *, e) forms a___________

(a) sub semi group of M (b) semi group of M (c) sub monoid of M (d) monoid of M

05. The maximum number of edges in a simple connected graph with 4 vertices is_____________

(a) 2 (b) 4 (c) 5 (d) 6

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

06. Define proposition.

07. Write the elements of the set N_n in list form.

08. Write down the definition of lattice.

09. Find the type of grammar in the productions $S \to aAB$; $AB \to bB$; $B \to b$; $A \to aB$

10. Define isolated vertex.

(CONTD …. 2)

ETHICAL PAPER

SECTION – B **(5 X 5 = 25 MARKS)**

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

11. a) Construct a truth table of $(p \vee q) \rightarrow (p \wedge q)$

(OR)

b) Prove that $(\neg p \leftrightarrow \neg q) \leftrightarrow (p \leftrightarrow q)$ is a tautology.

12. a) If R and S be relations on a set A is defined as follows

R = (a, b), (b, a), (b, b), (b, c), (c, a) and S = (a, b), (b, b), (b, c), (c, a), (c, b), (c, c)

Find the matrices that represent R∪S, R•S and S•R

(OR)

b) Prove that a fuzzy set A on R is convex iff $A (\lambda x_1 + (1 - \lambda) x_2 \geq \min [A (x_1), A (x_2)]$ for all $x_1, x_2 \in R$ and all $\lambda \in [0, 1]$ where min denotes minimum operator.

13. a) If S = {1, 2. 3, 4, 5 and if the functions f, g : S → S are given by

f = (1, 2), (2, 1), (3, 4), (4, 5), (5, 3) and g = (1, 3), (2, 5), (3, 1), (4, 2), (5, 4) then verify f•g =g•f and find f^{-1} and g^{-1}.

(OR)

b) Draw the Hasse diagram represent the partial ordering ((A, B) | A ⊆B) on the power set P(S), where S = a, b, c . Find the greatest and least elements of the Poset.

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14. a) If * is the binary operation on the set R of real numbers defined by a * b = a+ b +2ab then prove that (R, *) is a semi group. Also find the identity element.

(OR)

b) Find the language generated by the grammar G = ((S, A, B), (a, b), (S, P)) where P is the set of production{S → AB; S → AA; A → aB; A → ab; B → b.

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

(OR)

b) Define Path in a graph and write down the steps to find shortest path using Dijkstra's algorithm.

SECTION – C **(5 X 8 = 40 MARKS)**

ANSWER EITHER (a) OR (b) IN EACH OF THE FOLLOWING QUESTIONS. (K4 (Or) K5)

16. a) Verify whether the following compound propositions are tautology or contradiction.

(i) $((p \rightarrow q) \wedge (q \rightarrow r)) \rightarrow (p \rightarrow r)$

(ii) $\neg (q \rightarrow r) \wedge r \wedge (p \rightarrow q)$

(OR)

b) Using truth table obtain the principal disjunctive normal form and principal conjunctive normal form of $(p \rightarrow (q \wedge r)) \wedge (\neg p \rightarrow (\neg q \wedge \neg r)$

17. a) If R is the relation on the set of positive integers such that $(a, b) \in R$ if and only if ab is a perfect square. Show that R is an equivalence relation.

(OR)

b) Show that every fuzzy complement has at most one equilibirium.

18. a) If $f : Z \rightarrow N$ is defined by $f(x) = 2x - 1$ if $x > 0$ and $f(x) = -2x$ if $x \leq 0$ then prove that f is one – one and onto. Also determine f^{-1}.

(OR)

b) State and prove distributive inequalities of Lattice.

19. a) If Z_6 is the set of equivalence classes generated by the equivalence relation " congruence modulo 6", prove that (Z_6, X_6) is a monoid where the operation X_6 is defined by

$[i]\ X_6\ [j] = ([iXj]\ (\text{mod } 6)]$ for any $[i]\ X_6\ [j] \in Z6$

(OR)

b) Find a context – free grammar G which generates the language L that consists of all words in a and with twice as many a's as b's

20. a) Define complete, regular and bipartile graphs with an example.

(OR)

b) Show that the maximum number of edges in a simple disconnected graph G with n vertices and k components is $(n - k)(n - k + 1) / 2$.

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